SONY

HD CAMCORDER

# HDW-F900

HDCAM Tele-File

MEMORY STICK CINEALTA

MAINTENANCE MANUAL Part 2
Volume 1 1st Edition
Serial No. 10001 and Higher

## ⚠警告

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お客様が，このマニュアルに記載された設置や保守，点検，修理などを行うと感電や火災，人身事故につながることがあります。
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## ⚠WARNING

This manual is intended for qualified service personnel only.
To reduce the risk of electric shock, fire or injury, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

## ⚠WARNUNG

Die Anleitung ist nur für qualifiziertes Fachpersonal bestimmt.
Alle Wartungsarbeiten dürfen nur von qualifiziertem Fachpersonal ausgeführt werden. Um die Gefahr eines elektrischen Schlages, Feuergefahr und Verletzungen zu vermeiden, sind bei Wartungsarbeiten strikt die Angaben in der Anleitung zu befolgen. Andere als die angegeben Wartungsarbeiten dürfen nur von Personen ausgeführt werden, die eine spezielle Befähigung dazu besitzen.

## ⚠AVERTISSEMENT

Ce manual est destiné uniquement aux personnes compétentes en charge de l’entretien. Afin de réduire les risques de décharge électrique, d’incendie ou de blessure n’effectuer que les réparations indiquées dans le mode d’emploi à moins d’être qualifié pour en effectuer d’autres. Pour toute réparation faire appel à une personne compétente uniquement.

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# Manual Structure

## Purpose of this manual

This manual is the maintenance manual part 2 volume 1 of HD camcorder HDW-F900.
This manual is intended for use by trained system and service engineers, and is provided information that is premised parts levels service for this unit.

## Related manuals

Besides this maintenance manual part 2 volume 1, the following manuals are available.

- **HDW-F900 Operation Manual (Supplied with this unit)**
  This manual is necessary for the use and the operation of this unit.
  Part No.: 3-203-941-XX

- **HDW-F900 Maintenance Manual Part 1 (Supplied with this unit)**
  This manual is provided the information required for the installation, maintenance information and information for primary service.
  Part No.: 3-204-101-XX

- **HDW-F900 Maintenance Manual Part 2 Volume 2 (Available on request)**
  This manual is provided information that is premised the parts level service (exploded views, block diagrams, board layouts, schematic diagrams, detailed parts lists and the like.) for this unit.
  If this manual is required, please contact to your local Sony Sales Office/Service Center.
  Part No.: 9-968-564-XX

- **HDVF-20A Operation Manual (Supplied with HDVF-20A)**
  This manual is necessary for the use and the operation of HDVF-20A.
  Part No. : 3-203-934-XX

- **HDVF-20A Maintenance Manual (Available on request)**
  This manual is provided information that is premised the parts level service (adjustments, board layouts, schematic diagrams, detailed parts lists and the like.) for HDVF-20A.
  If this manual is required, please contact to your local Sony Sales Office/Service Center.
  Part No. : 9-968-559-XX

- **“Semiconductor Pin Assignments” CD-ROM (Available on request)**
  This “Semiconductor Pin Assignments” CD-ROM allows you to search for semiconductors used in Communication System Solutions Network Company equipment.
  Semiconductors that cannot be searched for on this CD-ROM are listed in the maitenance manual for the corresponding unit. The maitenance manual contains a complete list of all semiconductors and their ID Nos., and thus should be used together with the CD-ROM.
  Part number: 9-968-546-XX

## Contents

The maintenance manuals part 2 volume 1 are organized by following sections.

### Maintenance Manual Part 2 Volume 1

**Section 1 Service Overview**
This section is described about the extension board, the CCD unit, fixtures and measuring equipment for adjustment and the like.

**Section 2 SERVICE Menu**
This section is described about the SERVICE menu.

**Section 3 Replacement of Parts**
This section is described about the replacement of boards, the CCD unit, drum head, capstan motor, reel motor, tape guides and the like.

**Section 4 Alignment after Replacement of Parts**
This section is described about the mechanical adjustment and tape path alignment after replacement of parts.

**Section 5 Camera System Electrical Alignment**
This section is described about the camera system electrical adjustment.

**Section 6 VTR System Electrical Alignment**
This section is described about the VTR system electrical alignment for servo, audio, RF and the like.

# Section 1
# Service Overview

## 1-1. Circuit Description

### (1) Camera Processing Block

**BI-145 board**

The BI-145 board supplies the bias voltage required for the CCD. It also drives the reset gate for the horizontal drive and reading of the CCD.
The CCD output signal is output to the NR-68 board through the buffer.

**CN-1946 board**

The CN-1946 board is the relay board that supplies each CCD driving pulse generated on the DR-411 board to the BI-145 board. It also creates the voltage for the horizontal driving of the CCD and supplies it to the BI-45 board.

**DR-411 board**

The DR-411 board mounts the vertical clock drivers for CCD driving, drivers for a shutter pulse and V/H driver. And the DR-411 board generates the V-sub voltage proper to the CCD and then supplies it to the CCD.
The various voltages required in the CCD block are input to the DR-411 board using the flat cable from the mother board and distributed to each board.

**TG-213 board**

The TG-213 board is mounted with a VCO which serves as the reference clock of the camera, and the oscillation frequency is controlled by the SG-267 board. The reference clock is sent to the SG-267 board via the differential circuit. The TG-213 board creates various CCD drive pulses and sample-hold pulses synchronized with the OHB-F and OHB-H pulses from the SG-267 board.

**PA-238 board**

The CCD output is split into two channels. The PA-238 board is provided with a multiplexer which is used to return the split signals to their normal state.

**NR-68 board**

The NR-68 board performs correlative double sampling so as to extract a noise from the CCD output signals.

**DU-19/RP-113 board**

The DU-19 and RP-113 boards mount the RPN correction circuit for the CCD.

**VA-195 board**

The VA-195 board is composed of the video amplifier circuit, gain up amplifier circuit, white balance/white shading correction circuit, and test signal generation circuit, etc.
The R/G/B signals input from the CCD block are black-clamped after passing through the differential amplifier, passed through the pre-white clip circuit, and eliminated for clock components in the LPF. In the pre-white clip circuit, signal level above 600 % is clipped to prevent input of excessively large signals to circuits in the later stage. These signals then pass through the gain up amplifier circuit, and white balance/white shading correction circuit, and output to the AD-167 board.

**AD-167 board**

The AD-167 board performs flare correction and A/D conversion.
The R/G/B signals input from the VA-195 board are flare-compensated after being clamped, and added with the digital feedback signal. They are then eliminated for high range components in the LPF, and A/D converted at 74 MHz and 12 bits.
The converted digital signals are output to the DPR-157 board latched at 74 MHz clock.

**DPR-152 board**

The DPR-152 board is mounted with two LSIs; one LSI (SCVP: Camera Video Processor) performs main digital signal processing of the camera, and the other LSI (VFS: Video Frame Synchronizer) performs conversion of data rate.
The SCVP performs correction and signal processing of gamma, knee, detail, matrix, color bar generation and detection of the auto system. The Y/Pb/Pr signals and 3:1:1 signals output to the VCR are created by the SCVP and output.
The VFS converts (CDF: Common Data Format) the fixed clock rate (CDR: Common Data Rate) at the camera side according to the frame frequency during recording.
Reverse conversion is performed during playback.

### DPR-157 board

The DPR-157 board performs D/A conversion of the feedback signal of gain up and digital feedback by digital pixel addition.

### DA-148 board

The DA-148 board is input with the Y/Pb/Pr digital signals from the DPR-152 board, which are then sent to the VDA-51 board after D/A conversion.
The Y signal is D/A converted at 74 MHz.
For the Pb/Pr signals, the 37 MHz rate signals are separated and compressed, and input from the DPR-152 board alternately at 74 MHz. The signals input are separated into two signals simultaneously after being D/A converted.

### SG-267 board

The SG-267 board is mounted with an LSI which generates various timing pulses for the whole camera system. The timing pulses created here are then sent to each board.
The SG-267 board consists also of other GENLOCK circuits and VF character generation circuits.

### VDA-151 board

In the VDA-151 board, the Y/Pb/Pr signal input from the AD-167 board is added with sync, and output as the MONITOR OUT signal from the BNC connector at the camera side.
The Y/Pb/Pr signal is also output for the viewfinder. The Y signal for the viewfinder is mixed with markers such as CENTER MARKER, EFFECTIVE AREA, etc. according to the setting, zebra signals, and camera setting menus, etc. before it is output. The Y signal input from the GENLOCK IN terminal can also be switched as the return video signal and output to the viewfinder instead of the Y signal of the camera.

### IF-819 board

The IF-819 board is mounted with a CPU which performs various settings and control of the camera. The IF-819 board stores the various setting files such as reference files and scene files. It also performs communication with the VCR block and external remote controller and control of the fan.

### RE-145F board

The RE-145F board generates various voltages used in the CCD block.
(+24 V, +15 V, +7 V, +5 V, −5 V, −9 V)

## (2) Audio Processing Block (APR-55 board (1/2), CN-2025 board, CUE-2 board, HP-90 board, MA-92 board, VR-175 board)

The audio input consists of the front input (microphone) and rear CH1/CH2 input (MIC/LINE selectable). The AUDIO IN switch on the side panel is selected which input signal to record to CH1/CH2 on the tape. The unselected input signal will be recorded automatically to CH3/CH4 on the tape by setting the setup menu(*1) in the viewfinder to AUTO.

(*1) AUTO: Records the unselected input signal to CH3/CH4 of the tape.
1/2CH: Records the same signal recorded on CH1/Ch2 to CH3/CH4.
MUTE: Nothing is recorded to CH3/CH4.

The front input corresponds to an external power supply microphone. The front input signal is sent from the CN-1642 board to MA-92 board, and +48 V is supplied.
This signal is sent to the APR-55 board, and its level is adjusted in this board.
The level adjustment is performed using the MIC/MENU knob on the front panel.
The rear input corresponds to the following three inputs.

| | |
|---|---|
| LINE: | Reference level +4 dBu line input |
| MIC: | Internal power supply microphone input |
| +48 V ON: | External power supply microphone input |

The rear input signal is input from the AUDIO IN (CH1/2) connector on the rear panel (CN-2025 board), and its signal is selected by the LINE/MIC/+48 V ON switch on the rear panel. The selected signal is sent to the APR-55 board and its level is adjusted on this board.
The level of the rear input can be adjusted using the AUDIO LEVEL (CH1/CH2) knob on the side panel. However by setting the AUDIO SELECT (CH1/CH2) switch on the side panel to AUTO, automatic gain control (AGC) is applied. When using the rear (CH1) input as the microphone, its level can be adjusted using MIC/MENU knob on the front panel by switching the internal switch on the APR-55 board. The rear (line) input is +4 dBu as standard level (at factory setting level), but this level can be set to −3 dBu, 0 dBu or −1 dBu by switching the slit lands on the APR-55 board.

The input signal selected by AUDIO IN switch is passed through the AGC ON/OFF and INPUT LIMITER ON/OFF circuits. The selection of the headroom level of this signal is performed by selecting the slit lands on the midway amplifier. (Factory setting level is 20 dB.) This signal is entered to an emphasis amplifier, but the circuit function of this amplifier is turned ON/OFF according to the setup menu of the viewfinder. The output signal of the emphasis amplifier is sent to the A/D converter. The output signal of the A/D converter is encoded with the video signal and recorded on the tape.

The CH3/CH4 also have the A/D converter each, as well as the same functions for the selecting the headroom and emphasis as CH1/CH2. But the CH3/CH4 signals are recorded on the tape with AGC ON state.

The CH CUE recording signal is extracted before the CH1/CH2 emphasis amplifier. And this signal is sent to the CUE-2 board after selecting the CH1/MIX/CH2 using the CUE IN switch on the side panel, and analog-recorded in the CUE track.

During tape playback, normally CH1/CH2 data from the D/A converter is output. However CH3/CH4 data can also be output according to the setup menu on the viewfinder. The CH1/CH2/CH3/CH4 data cannot be output at the same time.

After passing the output signal from the D/A converter through the LPF, it is input to the REC/PB SELECTOR to select whether to output the input signal bypassing it or output the playback signal of this line. Then the signal is sent to the CUE ON/OFF SELECTOR after passing through the HEADROOM SELECTOR composed of the slit lands. (Factory setting level is 20 dB.) In the CUE ON/OFF SELECTOR, select whether to output the playback CH CUE signal or the playback signal of this line. After this, the signal is passed through the OUTPUT LIMITER circuit and sent to the output amplifier. The normal output level is 0 dBm (at factory setting level). However by switching the slit patterns, the output level can also be set to −3 dBm or +4 dBm.

After passing through the CUE ON/OFF SELECTOR, the signal is supplied to the MONITOR amplifier of the speaker and the earphone (HP-90 board). The monitoring channel is selected by MONITOR switch (VR-175 board) on the side panel. This switch cannot be selected the output signal of the AUDIO OUT connector on the rear panel.

The output signal of the APR-55 board is sent to the CN-2025 board and output as the stereophonic sound directly.

## (3) Digital Video Processing Block (DEC-95 (A), (B) boards, EN-143 board, ENC-59 board, VN-12 board)

### Frame frequency

This HD camcoder is compatible with the following eight video formats :

23.98PsF, 24PsF, 25PsF, 29.97PsF, 30PsF, 50I, 59.94I, 60I.

Inputs from the CCD are processed differently between P (progressive) and I (interlace). However in the VTR video block and external interfacing circuit, P is taken as PsF (Progressive segmented Frame) and divided into two fields for convenience, and subject to the same processing as I.

The difference in the frequency of 0.1 % is allowed by the switching of the generator on the camera block.

Consequently, the VTR video block handles the following three frame frequency formats (24F, 25F, 30F) :

24F : 23.98PsF, 24PsF

25F : 25PsF, 50I

30F : 29.97PsF, 30PsF, 59.94I, 60I

### Data transfer methods CDR and CDF

Data transfer to inside the camera block and to external peripheral equipment is carried out at the CDR (Common Data Rate) method, whereas data transfer to inside the VTR block is carried out by the CDF (Common Data Format) method.

Regardless of the frame frequency, the CDR method maintains the transfer clock frequency at a certain rate. When the frame frequency is set to a low level, H blanking becomes longer due to the longer length of one line.

In the camera block, the CDR method is used for all processes from data transfer from the CCD to monitor output.

The CDF method changes the transfer clock frequency proportionately to the frame frequency. The length of one line and the time ration of the effective period and blanking period is maintained at a constant level and processed at the same format at all times. All VTR blocks apply the CDF method. The tape speed and head recording frequency are also made proportionate to the frame frequency so that the recording patterns on the tape are the same, but tape can be played back at different frame frequencies.

The tape recording time is reverse-proportionate.

CDR/CDF method conversion is performed by the VFS (Video Frame Synchronizer) on the DPR-152 board.

The HENC (HDCAM, BRR-Encoder) mounted on the ENC-59 and EN-143 boards performs compression by the HDCAM format. It is mounted on the ENC-59 board at side A and on the EN-143 board at side B. After compression, the data is sent to the ECC (ECC-Encoder) on the ENC-59 board.
The ECC mounted on the ENC-59 board is added with the inner and outer error collection code. After conversion to the 8-head recording data, the recording data is sent to the drum via the HN-243 board.
5 types of VCOs are switched according to the recording frequency and supplied to the ECC.
The TG (Timing Generator) mounted on the EN-143 board generates 3:1:1 CDR and CDF clock and reference sync from the 74 MHz clock and sync sent from the camera, and supply them to each part of the VTR. The audio FS clock is also generated here.
The DE (ECC-Decoder) mounted on the DEC-95 board decodes the error-collection codes of the playback data sent from the EQ-89 board to correct the inner and outer errors. The data that cannot be corrected is added with error flags and sent to the CNC (Video Error Concealment) on the VN-12 board via the HDEC (HDCAM BRR-Decoder). Audio error correction and error concealment are also performed by DE. The DEC-95 board is composed with two same boards. The side A is processed by the left side board while B is processed by the right side board. A/B differentiation is performed based on the pin (Hi/Lo) on the MB-877 board. The audio data of side B is sent to the DE of side A, and using the data of both A and B, concealment is performed, after which the data is sent to the APR-55 board.
The HDEC mounted on the DEC-95 board performs expansion processing based on the HDCAM format.
The CNC mounted on the VN-12 board performs error concealment to the 3:1:1 CDF data after expansion by sides A and B. Based on the error flag attached by DE, errors are corrected referring to the data in front and behind.

## (4) System Control Block (APR-55 board (2/2), CCM-33B board, KY-293 board, SY-285 board)

### SY-285 board

Performs system control of the VTR block and sets the signal processing block IC. The operating clock frequency of the CPU is 17.301 Hz. The system control block has a 4 Mbit flash memory for programming and two 256 Kbit SRAMs for the work area. It is mounted with a time code reader and generator as the peripheral device to play the recording TC, read the playback TC, and read the EXT TC.The control of the signal processing IC is performed by parallel bus.
The CPU of the IF-819 board and CPU of the SV-218 board communicate using the dual port RAM.

### KY-293 board

STOP, PLAY, FF, REW, and EJECT buttons are equipped. Key information is sent to the SY-285 board. PLAY, FF, and REW lamps are also equipped to display the state of VTR.

### CCM-33B board

Connected with the serial port to read and write Tele-File data.

### APR-55 board (2/2)

Performs the signal processing of the audio block. It is mounted with a real time clock. To back up the user bits and time code, this board is provided with a backup power supply using lithium battery.

## (5) Servo Control Block (CTL-10 board, HN-243 board, SE-275 board, SV-218 board)

### SV-218 board

The CPU on the SV-218 board controls the servo control block. The ROM for programming uses a 4 Mbit flash memory. Two 256 Kbit SRAMs are used as the RAM for the work area. The operating frequency is 16.903 MHz.
The servo control block communicates with the system control CPU via the dual port RAM on the SY-285 board.
The CPU is mounted with the counter, built-in PWM module, and A/D converter to realize a simple circuit configuration.
Cassette information and mechanism deck information are input to the PIO on the SV-218 board via the HN-243 board from the SE-275 board. The S-REEL FG and T-REEL FG and drum PG/FG are connected to the counter incorporated in the CPU. The capstan motor FG is waveform-shaped by the circuit in the SV-218 board, and input to the counter in the CPU.
The PWM module in the CPU performs drum and capstan control. The PWM output of the CPU is passed through the filter and amplifier on the SV-218 board and sent to the motor.

### SE-275 board

The SE-275 board is a sensor board which detects the coding holes of the tape, tape top and end, and threading position.

### HN-243 board

Relays the signals of the mechanism deck to the SV-218 board.
This board is mounted with a NVRAM which stores servo adjustment data.

### CTL-10 board

Converts CTL signal generated by the SV-218 board to the waveform recorded in the tape.
It also converts CTL waveform recorded on the tape to signals that can be used by the CPU during playback.

## (6) RF Block (EQ-89 board, HN-243 board, drum assembly)

The HD camcorder records video and audio signals in the HDCAM format on tape.
With this unit, the eight rotary recording heads are mounted to record data of one frame at 1.5 rotations (12 tracks) of the drum. With this unit, the number of frames per second is 30, 29.97, 25, 24, or 23. 98 (five types) and the number of rotations of the drum differs according to the number of frame. At the same time, to match the recording pattern of the tape, the data rate of the tape speed and recording signals also change automatically.
During recording, recording signal sent from the digital ENC-59 board is sent to the drum via the HN-243 board. The setting of the recording current and switching of the circuits in the drum are performed by the MPX signal sent from the ENC-59 board.
During playback, the output from the drum is amplified once by the HN-243 board to equalize playback in the EQ-89 board, extract playback clocks, and detect playback envelope. The playback data and playback clocks are sent to the DEC-95 board of the digital block. At the same time, playback envelope information is sent to the SY-285 board and used as the alarm information of the RF signal.

### (7) Power Supply Block (PS-569 board, RE-139 board and RE-140 board)

#### PS-569 board

The input DC 12 V from the battery pack or DC IN connector is input to the PS-569 board where the input 12 V passes through a breaker and the POWER switch, then it is output as an UNREG +12 V.
This output voltage is sent not only to the camera and VTR blocks but also to the RE-140 board and RE-145F board.

#### RE-139 and RE-140 boards

The RE-139 and RE-140 boards make up a DC-DC converter.
The UNREG +12 V supplied from the PS-569 board is converted to the various output DC voltages which are sent to the camera and VTR. The voltage is supplied to the CCD block from the RE-145F board.
The converter system uses an highly efficient synchronous type PWM switching regulator system.
The PWM switching regulator is equipped with a short-circuit protection circuit which turns off all outputs when any of the output power is shorted to GND. The PWM switching regulator is also equipped with the cut-off circuit which shuts down the output power when the input voltage is decreased below the guaranteed operating voltage.

## 1-2. Extension Board

The following extension boards are available as options for checking the plug-in board.
Before working on the plug-in board, attach the extension board to the unit, and attach the plug-in board to be checked to the extension board.
Refer to Section “2-5. Plug-in Board Removal and Installation” of the Maintenance Manual Part 1 to plug-in board removal.

**Note**

Be sure to turn off the power when removing and installing the plug-in board, and in addition to disconnecting the cord connected to DC IN connector.

| Extension board | Sony Part No. | Connectable plug-in board |
|---|---|---|
| EX-410 | J-6420-260-A | RE-145F, VA-195, VDA-51, SG-267, DEC-95, EN-143, ENC-59, EQ-89, RE-140, VN-12 |

## 1-3. Disconnecting/Connecting Flexible Card Wire

The eight flexible card wires are used as follows :
Take care not to break the flexible card wire. This shorten the wire life.

| | |
|---|---|
| • Between APR-55 and MB-877 : | Qt'y 3 |
| • Between CN-2024 and MB-877 : | Qt'y 1 |
| • Between DPR-152 and MB-877 : | Qt'y 1 |
| • Between DR-411 and MB-877 : | Qt'y 1 |
| • Between CN-2025 and CN-2046 : | Qt'y 1 |
| • Between antenna flexible board FL-260 and CCM-33B : | Qt'y 1 |

---

### Disconnecting

1. Turn off the power.
2. Slide the two areas marked * on the connector in the arrow direction (white), and pull out the flexible card wire.

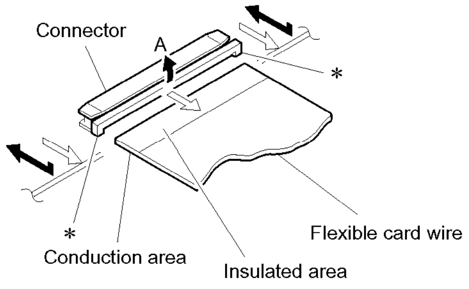
---

### Connecting

**Notes**

- Be careful not to insert the flexible card wire obliquely.
- Check that the conductive surface of the flexible card wire is not soiled with dust.

1. Lift the two areas marked * on the connector in arrow direction A, and insert the flexible card wire deep inside.
2. Insert the two areas marked * on the connector in arrow direction (black).



## 1-4. Removing/Attaching the Connector Box

**Note**

Perform the following procedures with the battery pack removed.

### Removal

1. Remove the front lid and outside panel, and open the inside panel. (Refer to Section 2-4 of the Maintenance Manual Part 1.)
2. Remove the two relay boards (CN-2044, CN-2078), and remove the seven plug-in boards (IF-819, SV-218 SY-285, EQ-89, VN-12, DEC-95 board ×2). (Refer to Section 2-5 of the Maintenance Manual Part 1.)
3. Disconnect the three connectors (CN45, CN46, and CN48) of the MB-877 board.
4. Loosen the screw securing the board guide rail (lower) and flexible cover, and slide the flexible cover in direction A.
5. Disconnect CN20 of the CN-2025 board.
6. Loosen the two screws and slide the shoulder pad in arrow direction B.
7. Remove the four screws, and remove the connector box in arrow direction C.

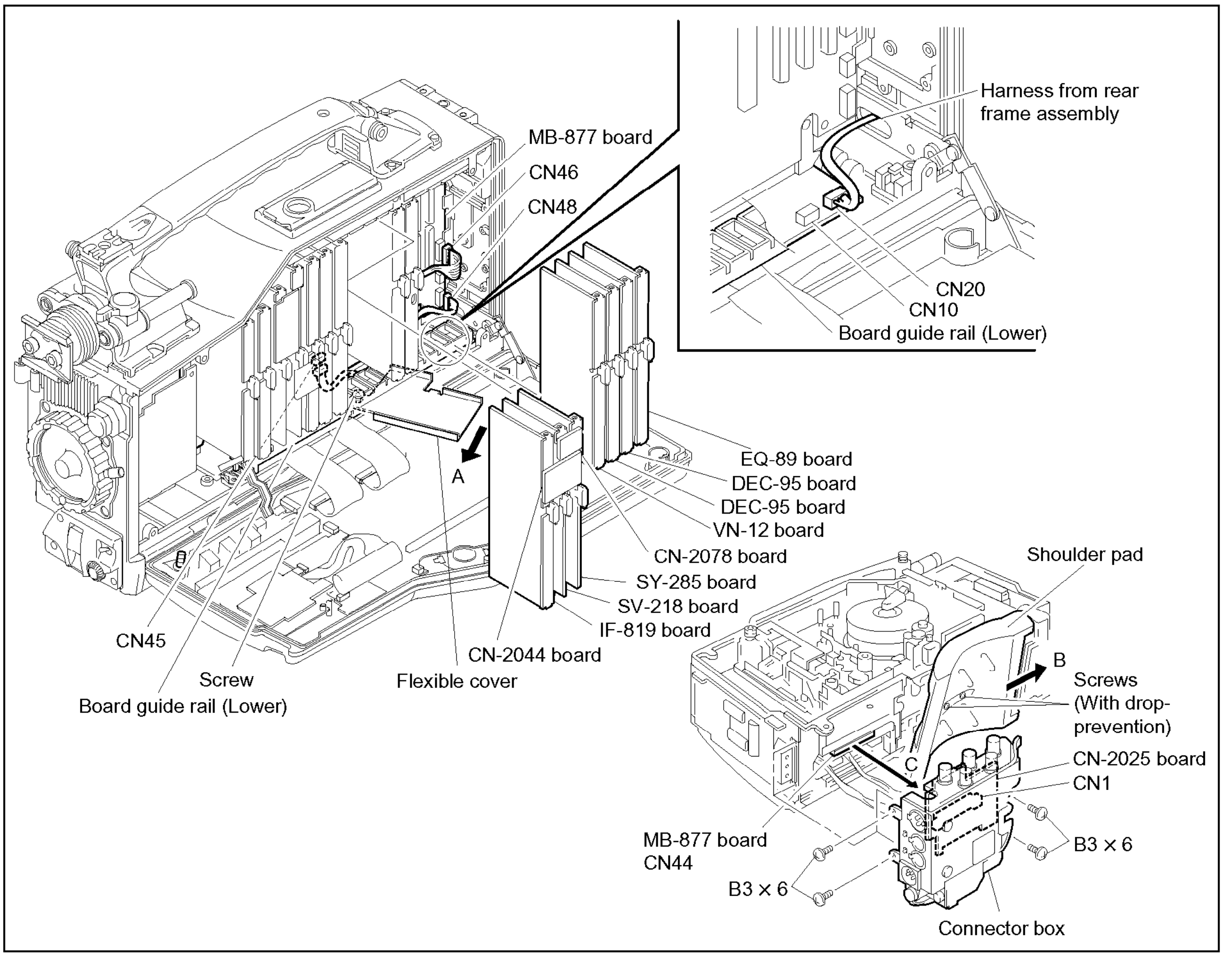
### Attachment

1. Connect CN1 of the CN-2025 board of the connector box to the CN44 of the MB-877 board.
2. Attach in the reverse order of steps 1 to 7 of removal.

   **Note**

   Re-insert each board and connector correctly.

3. Perform tape running adjustment and video tracking adjustment. (Refer to Sections 4-2-2 and 4-2-3.)


MB-877 board
CN46
CN48
Harness from rear frame assembly
CN20
CN10
Board guide rail (Lower)
A
EQ-89 board
DEC-95 board
DEC-95 board
VN-12 board
CN-2078 board
SY-285 board
SV-218 board
IF-819 board
CN-2044 board
Flexible cover
CN45
Screw
Board guide rail (Lower)
Shoulder pad
B
Screws (With drop-prevention)
C
CN-2025 board
CN1
B3 x 6
MB-877 board
CN44
B3 x 6
Connector box

## 1-5. Setting/Adjusting after Replacing the Boards and Blocks

Followings are the setting and adjustment items to be performed after the block and board replacement.
It is not necessary to perform the setting and adjustment for other boards described in the following.

| Board/Block | Setting/Adjusting Items |
|---|---|
| CCD block | Execute the AUTO LEVEL *1<br>2-4. Manual RPN Correction<br>(Perform this adjustment when the RPN disappeared even if AUTO LEVEL adjustment executed.) |
| Drum | 6-5. Servo system adjustment<br>6-7. RF system adjustment |
| CUE head | 6-6-4. CUE playback level adjustment<br>6-6-5. CUE recording bias adjustment<br>6-6-6. CUE recording level adjustment |
| AD-167 | Execute the AUTO LEVEL *1 |
| APR-55 | Switch/Slit land settings<br>6-6. Audio system adjustment |
| CCM-33B | 6-8. CCM-33B board adjustment |
| CUE-2 | 6-6-4. CUE playback level adjustment<br>6-6-5. CUE recording bias adjustment<br>6-6-6. CUE recording level adjustment |
| DA-148 | 5-6. DA-148 board adjustment |
| EQ-89 | 6-7. RF system adjustmentt |
| HN-243 | Switch settings *2<br>6-5. Servo system adjustment<br>6-7. RF system adjustment |
| IF-819 | Switch settings *2<br>Replace IC211 and IC206.<br>(Refer to Section 1-7.) |
| PA-238 | 5-3. PA-238 board adjustment |
| RP-113 | Replace the IC6 with the used one on the former board.<br>(Refer to Section 1-8.) |
| SH-74 | 5-4. SH-74 board adjustment |
| TG-213 | Execute the AUTO LEVEL *1 |
| VA-195 | Execute the AUTO LEVEL *1 |
| VDA-51 | 5-5. VDA-51 board adjustment |
| Antenna flexible board | 6-8. CCM-33B board adjustment |
| Cassette compartment Assembly | 6-8. CCM-33B board adjustment |
| Filter disk unit,<br>ND filter | 5-9. Adjustment after replacement of ND filter |

*1: Perform AUTO LEVEL using AUTO SETUP page of MAINTENANCE menu.
*2: Refer to Section 2-3 of the Maintenance Manual Part 1.

## 1-6. Details of Data Saved by Board

The table below gives the stored data on the printed circuit boards:

| Board Name | REF No. | Stored Data |
|---|---|---|
| AD-167 | IC505 | AD-167 board adjustment data |
| APR-55 | IC505 | USER's BIT data,<br>Time code data |
| DA-148 | IC702 | DA-148 board adjustment data |
| HN-243 | IC1 | Servo system adjustment data,<br>RF adjustment data |
| IF-819 | IC211 | Main program of setting menu (For ROM version-up, refer to Section 1-10.) |
|  | IC206 | User setting value of the setting menu |
| RP-113 | IC6 | Overall adjustment data of CCD block |
| VA-195 | IC1 | VA-195 board adjustment data |

**Note**

The part numbers of these ICs which data is blank or factory-set are specified in “Section 1. Spare Parts” of the Maintenance Manual Part 2 Vol.2.

## 1-7. Note on the IF-819 Board Replacement

IC211 and IC206 on the IF-819 board store the following data.

| Ref. No. | Stored Data |
|---|---|
| IC211 | Main program of the setting menu |
| IC206 | User setting value of the setting menu |

IC211 on the IF-819 board cannot replace with a new one because of the stored data in the IC cannot reset.
When replacing the board, remove IC211 on the former board, and then reattach it to a new board.
If you want to replace the defective IC with a new one, please contact to your local Sony Sales Office/Service Center.
The setting data was written in IC 206 on the IF-819. When this IC is replaced with the new one depend on the board replacement or IC replacement, former customized data is reset to the factory setting.
If necessary, remove IC on the former board, and then reattach it to the new board.

## 1-8. Note on the RP-113 Board Replacement

IC6 on the RP-113 board stores the following data.

| Ref. No. | Stored Data |
|---|---|
| IC6 | Adjustment data of the CCD block |

When replacing the RP-113 board, remove IC6 on the former board, and then reattach it to a new board.

## 1-9. Note on Replacing the IC Link

**WARNING**

The IC link is critical for safe operation.
To avoid danger of a fire or electric shock, be sure use the specified component as a spare part when replacing it.

**CAUTION**

Replacement of the IC link of the plugged-in unit may be hazardous.
Be sure to turn off the power, and then unplug the cord from the DC IN connector before replacing the IC link.

An IC link is mounted on the B side of the PS-569 board. This will blow when the overcurrent flows because of internal circuit failure. If it blows, check the circuit for overcurrent after turning off the power.
And then, replace the IC link with specified part.

| Board | Ref. No. | Description | Part No. |
|---|---|---|---|
| PS-569 | F1 | IC Link | ⚠1-533-282-21 |

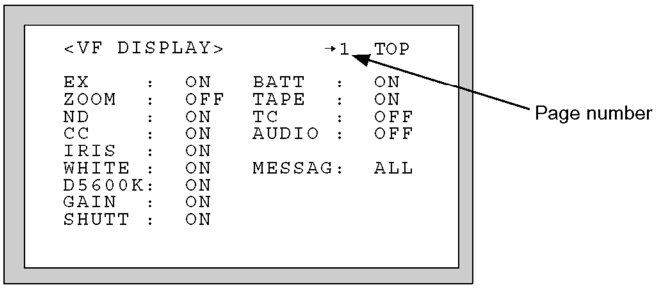
## 1-10. Version-Up of ROM/IF-819 Board

The ROM (IC211 on the IF-819 board) version can be upgraded using the memory stick. Follow the procedure shown below.

**Notes**

- Prepare the memory stick in which the upgraded program has been written.
- Refer to section 2-1 for basic operations of the setting menu.
- The version number of the ROM can be confirmed on the ROM VERSION page of the DIAGNOSIS menu.

1. Turn the power of the unit on. Open the VF DISPLAY page of the OPERATION menu and move the cursor to the page number.



```
<VF DISPLAY>          →1  TOP

EX     :  ON   BATT   :  ON
ZOOM   :  OFF  TAPE   :  ON
ND     :  ON   TC     :  OFF
CC     :  ON   AUDIO  :  OFF
IRIS   :  ON
WHITE  :  ON   MESSAG :  ALL
D5600K :  ON
GAIN   :  ON
SHUTT  :  ON
```

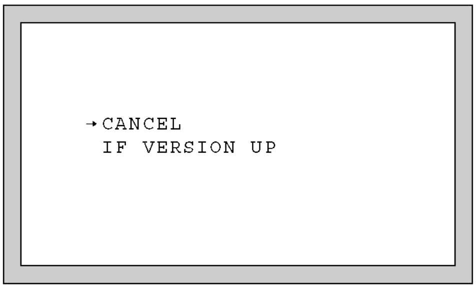
**VF DISPLAY page**

2. Press the rotary encoder to change the cursor to “?”.
3. Press the rotary encoder again. Insert the memory stick into the camera unit with pressing the rotary encoder and remain pressing the rotary encoder so that “MEMORY STICK ACCESS” is displayed on the screen.

   **Note**

   While “MEMORY STICK ACCESS” is displayed, do not eject the memory stick.

4. The VERSION UP execution page is displayed as shown below.
   Move the cursor to “IF VERSION UP” and then press the rotary encoder.



```
→CANCEL
 IF VERSION UP
```

**VERSION UP execution page**

5. After “VERSION UP OK?” is displayed, press the rotary encoder again.

   **Note**

   Press the MENU switch to “CANCEL” side to cancel the operation.
6. The back tally lamp behind the handle repeats blinking and lighting on, and lights off after about 30 seconds.

   If the back tally lamp remains lighting on and does not light off, proceed to step 8.
7. Turn the power off and then on. The unit will start with the ROM upgraded.

### At step 6, if the back tally lamp remains lighting on and does not light off

8. Turn the power off.
9. Set S300-1 to S300-4 switches on the IF-819 board as shown below.

   **Note**

   When the version-up is finished, be sure to set the following switches to their original positions. Therefore, it is recommend to write down the customer setting positions to the following table.

| Switch | Setting | Customer Setting Position |
|---|---|---|
| S300-1 | OFF | |
| S300-2 | OFF | |
| S300-3 | ON | |
| S300-4 | ON | |

10. Leave the memory stick inserted in the unit and turn the power on.
11. The back tally lamp behind the handle repeats blinking and lighting on, and lights off after about 30 seconds.
12. Turn the power off.
13. Set S300-1 to S300-4 switches on the IF-819 board to their original positions.
14. Turn the power on. The unit will start with the ROM upgraded.

# 1-11. Notes on CCD Unit

## 1-11-1. Spare CCD Units

The CCD block listed below is available separately.
Order the applicable block by CCD unit model through a sales channel for the CCD unit replacement.

| CCD unit model | CCD block type *1 |
|---|---|
| HKDW-C900R | AKA |

*1 : As for the detail on the CCD block type, refer to Section 1-11-2.

## 1-11-2. Description on CCD Block Number

Every CCD unit has its own ID number called CCD block number. It shows the CCD block type and serial number for the CCD block.
The CCD block number label is put in the CCD unit.

Example : AKA xxxxx
- xxxxx: Serial number for the CCD unit
- AKA: CCD block type

As for the procedure for replacing the CCD block, refer to Section “3-6-1. Replacing the CCD Block”.

## 1-11-3. Manual RPN Correction

The CCD RPN (Residual Point Noise) is concealed automatically (APR) while the automatic black balance adjustment (ABB) is being executed.
For the RPN which cannot be concealed by APR, perform the manual RPN correction referring Section 2-4.

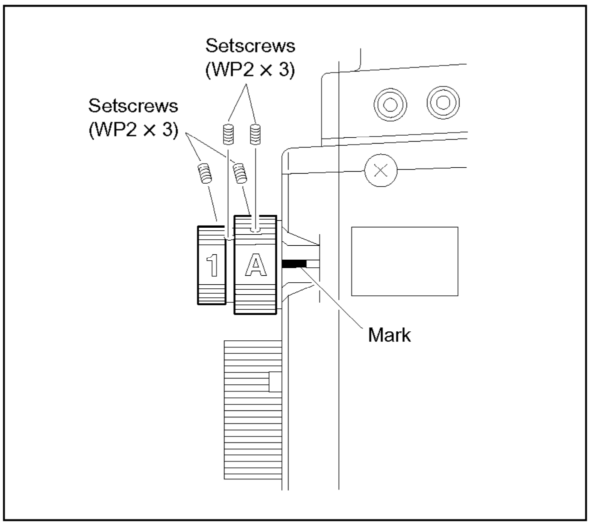
**Note**

Depending on the RPN position, in some cases RPN can not be concealed even by concealing manually.

# 1-12. Positioning Adjustment for Filter Knobs

Installing the filter knobs, be sure to perform the following adjustment.

1. Rotate the outer knob shaft until the cross filter can be seen from the lens mount.
2. Align the CC filter knob number A with the mark on the front panel and tighten the two setscrews.
   Tightening torque: $20 \times 10^{-2}$ N•m (2.0 kgf•cm)
3. Rotate the CC filter knob and check that it moves smoothly.
4. Rotate the inner knob shaft until the clear filter (straight through filter) can be seen from the lens mount.
5. Align the ND filter knob number 1 with the mark on the front panel and tighten the two setscrews.
   Tightening torque: $20 \times 10^{-2}$ N•m (2.0 kgf•cm)
6. Rotate the ND filter knob and check that it moves smoothly.

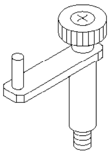


# 1-13. Fixtures and Measuring Equipment for Adjustment

## 1-13-1. Fixtures

| Fig. No. | Part No. | Description | Purpose |
|---|---|---|---|
| 1 | J-6001-820-A | Drum eccentricity gauge (3) | To adjust upper drum eccentricity |
| 2 | J-6001-830-A | Drum eccentricity gauge (2) | |
| 3 | J-6394-080-A | Gray scale chart (16:9 transparent type) | To adjust camera |
| | commercially available | Gray scale chart (4:3 reflective type) | |
| 4 | J-6029-140-A | Pattern box PTB-500 | To adjust camera |
| 5 | J-6035-070-A | IC extraction tool | To remove PLCC IC |
| 6 | J-6080-840-A | Mirror (Small round shape) | To adjust video tracking |
| 7 | J-6087-000-A | Drum eccentricity gauge (5) | To adjust upper drum eccentricity |
| 8 | J-6152-450-A | Wire clearance check gauge | To check clearance |
| 9 | J-6309-350-A | Board extraction tool | To remove card board |
| 10 | J-6322-420-A | Tape guide adjustment screwdriver | To adjust tape path |
| | J-6322-420-3 | Bit (0.89 across) | |
| 11 | J-6323-530-A | Stop washer insertion tool | To attach stop-washer |
| 12 | J-6323-750-A | MB dummy tool | To replace frame |
| 13 | J-6323-890-A | FWD back tension measuring cassette∗<br>(for Digital Betacam) | To adjust FWD back tension<br>To check brake torque |
| 14 | J-6324-150-A | Reel table height gauge | To adjust reel table height |
| 15 | J-6324-170-A | Cassette reference plate (1) | |
| 16 | J-6325-110-A | Torque screwdriver bit (M1.4) | To tighten screw |
| | J-6325-380-A | Torque screwdriver bit (M2) | |
| 17 | J-6326-120-A | Hexagonal bit (d = 1.5 mm) | |
| 18 | J-6325-400-A | Torque screwdriver (3 kg) | |
| 19 | J-6325-530-A | Upper drum eccentricity adjustment tool (6) | To adjust upper drum eccentricity |
| 20 | J-6420-260-A | Extension board EX-410 | To check/adjust card board |
| 21 | J-6420-900-A | MB conversion board | To check HN board operations |
| 22 | J-6510-070-A | TP tool | To adjust tape running |
| 23 | 3-184-527-01 | Cleaning cloth | To clean |
| 24 | 7-661-018-18 | Oil (NT-68) | To lubricate |
| 25 | 7-651-000-11 | Sony grease (SGL-801) | |
| 26 | 7-700-736-05 | Hexagon wrench (d = 1.5 mm) | To remove screw |
| | 7-700-736-06 | Hexagon wrench (d = 0.89 mm) | |
| 27 | 8-960-076-01 | Alignment tape HR5-1A | To adjust audio/video |
| | 8-960-076-11 | Alignment tape HR2-1A | To adjust video tracking |
| 28 | 9-919-573-01 | Head cleaning liquid | To Clean |
| 29 | J-6510-120-A | RS-232C interface cable | To upgrade software version |
| 30 | J-6510-150-A | RF envelope tool | To adjust RF error rate |
| 31 | 7-432-950-03 | TSE392-W | To attach card door assembly and camera sw cabinet |
| – | – | Memory stick (commercially available) | To save the camera settings |

∗ : It is necessary to perform the modification for using the HDCAM.

1


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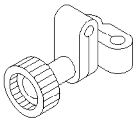

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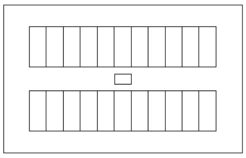

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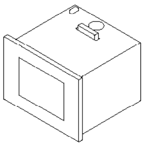

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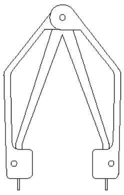

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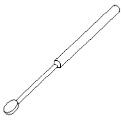

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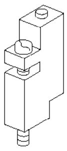

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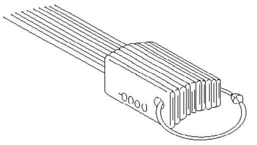

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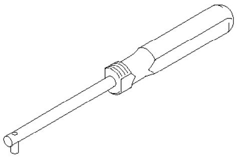

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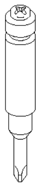

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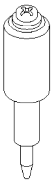
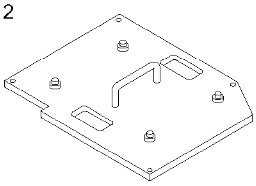


12


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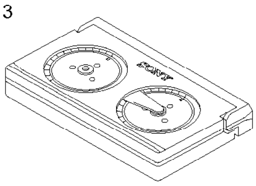

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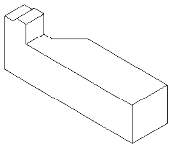

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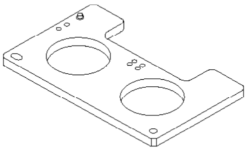

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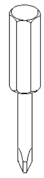

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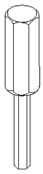

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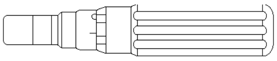

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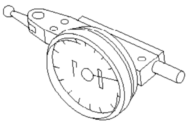

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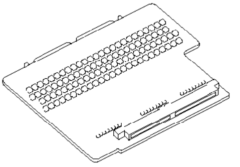
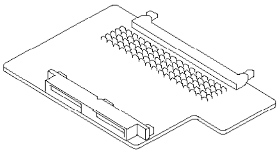
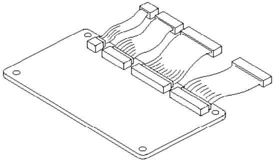
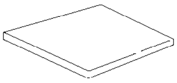


21


22


23


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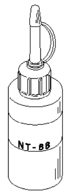

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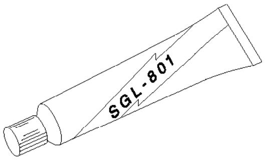
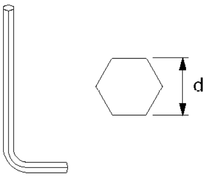
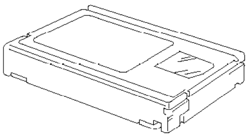
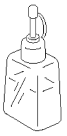
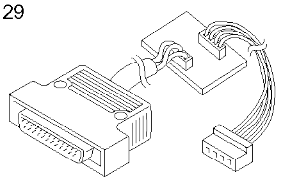
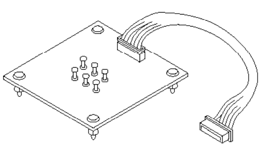


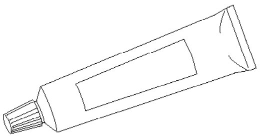
26


27


28


29


30


31


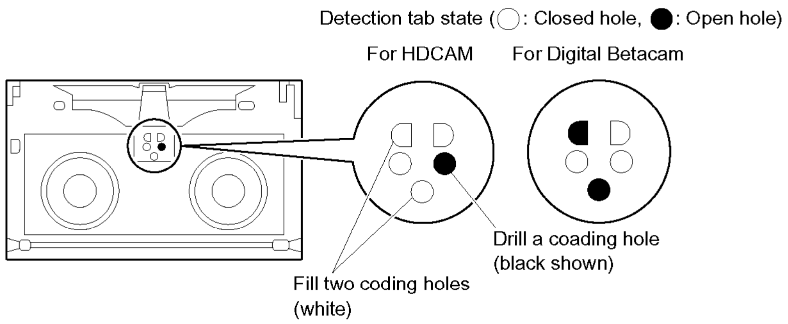
## 1-13-2. Measuring Equipment

Use of the measuring equipment listed below or equivalent is recommended.
All the measuring equipment listed is available commercially.

| Equipment | Model Name | Remarks |
|---|---|---|
| AC adaptor or battely | SONY AC-550 | |
| Oscilloscope | TEKTRONIX 2465B | |
| HDTV Analog Waveform Monitor | TEKTRONIX 1735HD/1730HD | |
| HDTV Digital Waveform Monitor | LEADER LV5150D<br>TEKTRONIX WFM1125 | |
| Audio Analyzer | TEKTRONIX AA501A (OP.02) | for measuring distortion and levels |
| Audio Level Meter | HEWLETT PACKARD HP3400A | |
| Low Frequency Oscillator | HEWLETT PACKARD HP8904 | |
| Frequency Counter | ADVANTEST TR5821AK | |
| Digital Voltmeter | ADVANTEST TR6845 | |
| Black and White Monitor<br>(Horizontal resolution more than 900)<br>HD SDI-capable Monitor | <br><br>SONY BVM-D20F1J/D14H5J | |

## 1-13-3. Note for Using FWD Back Tension Measuring Cassette Tape

The FWD back tension measuring cassette tape (Sony Part No. : J-6323-890-A) is designed for Digital Betacam, then the state of the coding hole (open or close) on the back side is different from the HDCAM tape. Before using this measuring cassette tape for HDCAM, drill a coding hole (black shown in figure) and fill two coding holes (white) with vinyl tape.



# 1-14. Alignment Tape

Describes the alignment tapes using for adjusting the unit.

1. Alignment tape HR2-1A (Part No. 8-960-076-11)

| TIME CODE | CTL | CUE | VIDEO / AUDIO |
|---|---|---|---|
| (00:00:00:00)<br>CTL PULSE | ↕ | 1 kHz<br>0 VU | 8T A ch only<br>Marker at frame head SAT IN |
| (00:15:00:00)<br>00:15:00:00<br>General TIME CODE hereafter | | 12 kHz<br>0 VU | A ch 8T<br>C ch 8T |
| (00:20:00:00) | | | A/C ch first half 8T latter half 2T<br>B/D ch first half 2T latter half 8T |
| (00:25:00:00) | | | 2T<br>Marker at frame head Ach SAT IN<br>All channels |
| (00:30:00:00) | | | |

2. Alignment tape HR5-1A (Part No. 8-960-076-01)

| TIME CODE | CTL | VIDEO | D-AUDIO | CUE |
|---|---|---|---|---|
| 00h00m00s | ↕ | Color Bars (100%) | 1 kHz -20 dBFS | Refer to following table. |
| 00h02m00s | | | 1 kHz 0 dBFS | |
| 00h04m00s | | | −∞ dBFS | |
| 00h06m00s | | | 20 Hz -20 dBFS | |
| 00h08m00s | | | 20 kHz -20 dBFS | |
| 00h10m00s | | RAMP | Above is repeated. | |
| 00h15m00s | | | | |
| 00h20m00s | | Multi Burst | | |
| 00h30m00s | | | | |

| TIME CODE | | | | CUE |
|---|---|---|---|---|
| 00: 00: 00: 00 | 00: 05: 00: 00 | 00: 10: 00: 00 | 00: 15: 00: 00 | 1 kHz 0 VU |
| 00: 01: 25: 00 | 00: 06: 25: 00 | 00: 11: 25: 00 | 00: 16: 25: 00 | |
| 00: 01: 30: 00 | 00: 06: 30: 00 | 00: 11: 30: 00 | 00: 16: 30: 00 | 1 kHz -20 VU |
| 00: 02: 25: 00 | 00: 07: 25: 00 | 00: 12: 25: 00 | 00: 17: 25: 00 | |
| 00: 02: 30: 00 | 00: 07: 30: 00 | 00: 12: 30: 00 | 00: 17: 30: 00 | 3 kHz -20 VU |
| 00: 02: 55: 00 | 00: 07: 55: 00 | 00: 12: 55: 00 | 00: 17: 55: 00 | |
| 00: 03: 00: 00 | 00: 08: 00: 00 | 00: 13: 00: 00 | 00: 18: 00: 00 | 7 kHz -20 VU |
| 00: 03: 25: 00 | 00: 08: 25: 00 | 00: 13: 25: 00 | 00: 18: 25: 00 | |
| 00: 03: 30: 00 | 00: 08: 30: 00 | 00: 13: 30: 00 | 00: 18: 30: 00 | 10 kHz -20 VU |
| 00: 03: 55: 00 | 00: 08: 55: 00 | 00: 13: 55: 00 | 00: 18: 55: 00 | |
| 00: 04: 00: 00 | 00: 09: 00: 00 | 00: 14: 00: 00 | 00: 19: 00: 00 | 12 kHz -20 VU |
| 00: 04: 25: 00 | 00: 09: 25: 00 | 00: 14: 25: 00 | 00: 19: 25: 00 | |
| 00: 04: 30: 00 | 00: 09: 30: 00 | 00: 14: 30: 00 | 00: 19: 30: 00 | 90 Hz -20 VU |
| 00: 04: 55: 00 | 00: 09: 55: 00 | 00: 14: 55: 00 | 00: 19: 55: 00 | |

## 1-15. Battery for Memory Backup

The unit is equipped with a battery for the memory (IC505) backup on the APR-55 board. When replacing, be sure to use the specified part.

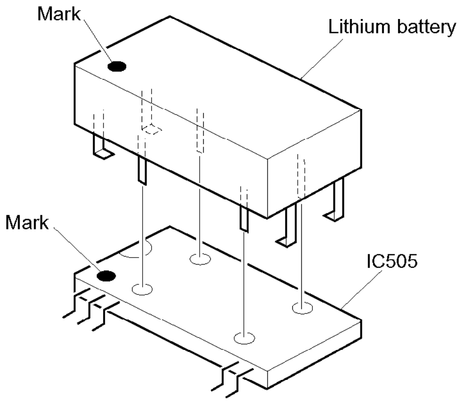
| | |
|---|---|
| Part Description: | M4T28-BR12SH1 (lithium battery) |
| Part No.: | 1-767-156-11 |
| Recommended Replacement Period: | Every five years |
| Replacement Part: | IC505/APR-55 board (A side) |

In the memory, following data are stored. When the battery is replaced with a new one, resetting user's bit and time code data are required. For details on how to reset, refer to the operation manual.

- USER's BIT data
- Time code data

**Note**

When replacing the battery, ensure that a mark on the battery is correctly oriented as shown in the following figure.
If connected incorrectly, injuries and damage to objects in the periphery may result from tears and leakage of fluid.

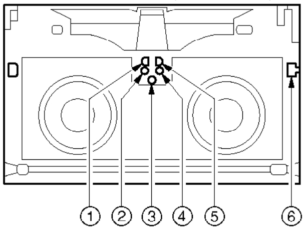


# 1-16. Mechanism of Cassettes

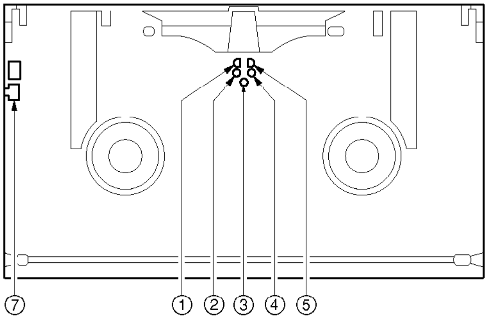
There are REC inhibit plugs and various detection tabs on the back of the cassette tape.

### HDCAM cassette

Small cassette (S cassette)

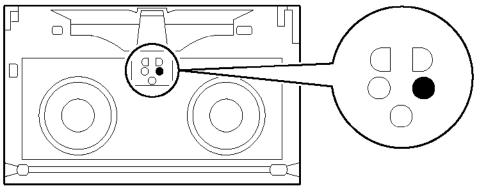


Large cassette (L cassette)

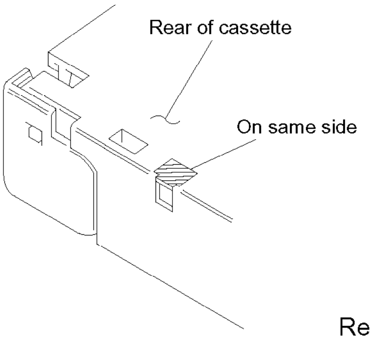


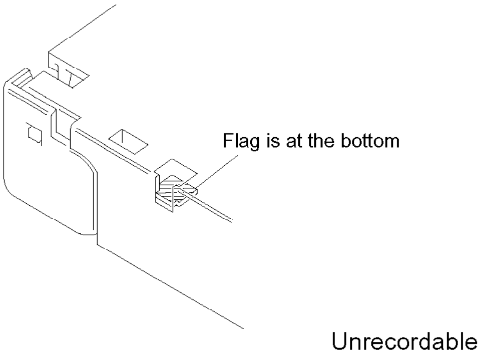
① Tape thickness detection hole
②③④ Cassette type detection tab
⑤ Cleaning cassette tape detection tab
⑥ S cassette record inhibit plug
⑦ L cassette record inhibit plug

Detection tab state (○: Closed hole, ●: Open hole)



## REC Inhibit Plugs


Rear of cassette
On same side
Recordable


Flag is at the bottom
Unrecordable

## Detection tabs

### HDCAM cassette

| No. | Use |
|---|---|
| ① | Tape thickness detection<br>With Tab (Closed Hole): Tape thickness is 13.5 μm |
| ⑤ | Cleaning cassette tape detection<br>With Tab (Closed Hole): Normal cassette tape<br>No Tab (Open Hole): Cleaning cassette tape |
| ②③④ | Cassette type detection<br>The HDCAM cassette has no tab only for ④ (Open hole). |

gM

# Section 2
# SERVICE Menu

In this section, describes the service menu (SERVICE menu) in the setup menu displayed on the viewfinder. For other menus, refer to Section 4 of the maintenance manual part 1.

## 2-1. Setup Menu

The setup menu is used for selecting various setting values, items displayed on the viewfinder screen, the method of displaying, and adjustments. The menu is displayed on the viewfinder screen. The menu can also be displayed by connecting an external monitor to the MONITOR OUT connector.
Normally, SERVICE menu will not be displayed in the setup menu, but this SERVICE menu can be displayed by setting the switches (S300-1 to S300-4) on the IF-819 board.

### Structure of Setup Menu

The setup menu is composed of the following menus.

- OPERATION menu
- PAINT menu
- MAINTENANCE menu
- FILE menu
- DIAGNOSIS menu
- SERVICE menu (This menu is not displayed at the factory setting state.)

**Note**

Beside above menus, the TOP menu is provided for indicating the whole configuration of the menu items.

### Selecting the Menu

The menus to be displayed on the viewfinder screen can be selected by the switches (S300-1 to S300-4) on the IF-819 board. At the factory setting state, the menu is set to display from OPERATION menu to DIAGNOSIS menu.

(  ) : Shows the factory setting

| Switch Settings | | | | Setup Menu | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S300-1** | **S300-2** | **S300-3** | **S300-4** | **OPERATION** | **PAINT** | **MAINTENANCE** | **FILE** | **DIAGNOSIS** | **SERVICE** |
| (OFF) | (OFF) | (OFF) | (OFF) | Yes | Yes | Yes | Yes | Yes | No |
| ON | OFF | OFF | OFF | Yes | Yes | Yes | No | Yes | No |
| OFF | ON | OFF | OFF | Yes | Yes | No | No | Yes | No |
| ON | ON | OFF | OFF | Yes | No | No | No | Yes | No |
| OFF | OFF | ON | OFF | Yes | No | No | No | No | No |
| ON | ON | ON | ON | Yes | Yes | Yes | Yes | Yes | Yes |

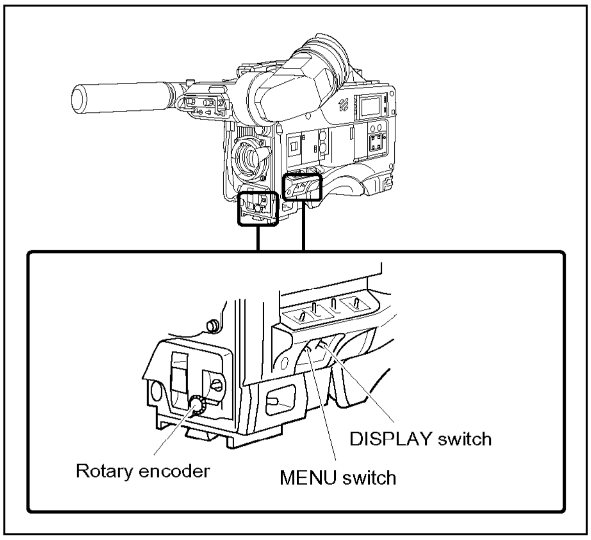
### Equipment Required

2-type viewfinder HDVF-20A (or black-and-white monitor)
A battery, or an AC adapter AC-550/550CE, etc. for supplying the power to the camcorder.

## Switches

### DISPLAY switch

ON : Displays characters and messages indicating the settings and operating status of the unit on the viewfinder screen.
OFF : Turns off all the displays on the viewfinder screen.
MENU : Displays the setup menu on the viewfinder screen.



### Rotary Encoder

Selects the items displayed on the viewfinder screen and changes settings.

### MENU switch

STATUS : Allows you to check the current setting.
CANCEL : Cancels the menu setting mode and returns to the page selection mode or TOP menu.

## Basic Operations

1. Displaying the menu
   To display the OPERATION menu, turn the power on and set the DISPLAY switch to “MENU”(*1).
   To display the other menus, set the DISPLAY switch from “OFF” to “MENU” while pressing the rotary encoder, and obtain the TOP menu screen. Turning the rotary encoder, select the menu to be displayed, and press the rotary encoder.
2. To change pages, set the cursor to the page number and turn the rotary encoder.
3. To shift the cursor, turn the rotary encoder. (Pressing the rotary encoder determins the setting.)
4. To change a setting value, set the cursor to the item to be changed and press the rotary encoder, then the cursor turns to “?” and the value changes by turning the rotary encoder.
   (Turning it fast, the value changes greatly, while turning it slowly, the value changes slightly for fine adjustment.) To determine the setting, press the rotary encoder, and to cancel the change, press the MENU switch toward the cancel side.
5. By every set of the MENU switch to “CANCEL”, the screen returns to the item selection mode, page selection mode, and then TOP menu(*2).
6. To exit from the menu, set the DISPLAY switch to “OFF”.

*1: The display screen at power on is changeable. For change, refer to MENU RESUME item in OTHERS 2 Page of the MAINTENANCE menu. (Refer to Section 4-5 of the Maintenance Manual Part 1.)
*2: The page selection mode is available, only when the basic operation step1 was performed and the operation started from the TOP menu.

## Displaying characters on an external monitor

When you want to display characters including the menu on an external monitor, proceed as follows.

1. Displaying characters (including the menu)
   While pressing the MENU switch toward the “CANCEL” side, set the DISPLAY switch from “OFF” to “MENU”.
2. To remove the characters/menu from the external monitor, while pressing the MENU switch towards the “CANCEL” side, set the DISPLAY switch from “MENU” to “OFF”.

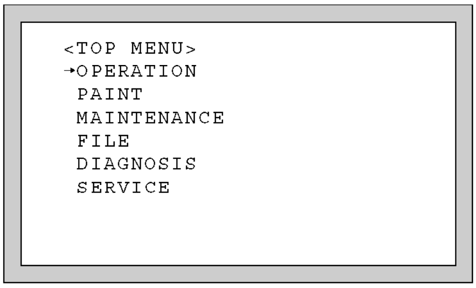
## 2-2. TOP Menu

The TOP menu is provided for indicating the whole configuration of the menu items.
The TOP menu can be displayed by setting the DISPLAY switch from OFF to MENU while pressing the rotary encoder.

**Note**

To select the menu to be displayed on the viewfinder, switch setting on the IF-819 board is required. For details, refer to “Selecting the Menu” in Section 2-1.

### TOP MENU

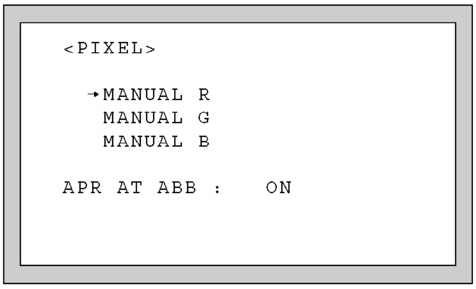


| Menu | Description |
|---|---|
| OPERATION | This menu consists of VF screen display items to be set by a camera operator. |
| PAINT | This menu consists of general paint operation items such as white. |
| MAINTENANCE | This menu consists of paint items used less frequently such as shading adjustment and items required for the maintenance of the camera such as system change. |
| FILE | This menu is used for performing file operations such as saving the reference file. |
| DIAGNOSIS | This menu describes the self-diagnosis and VTR status, etc. |
| SERVICE | This menu consists of the adjustments and settings required during servicing such as RPN correction, etc. |

## 2-3. SERVICE Menu

This menu consists of the adjustments and settings required during servicing such as RPN correction, etc.

### PIXEL page



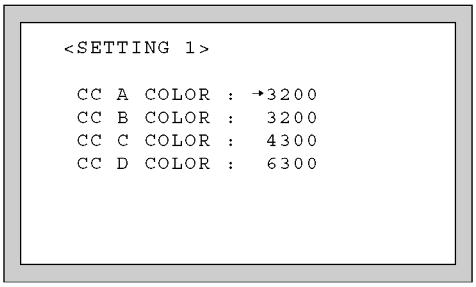
```
<PIXEL>

  →MANUAL R
   MANUAL G
   MANUAL B

APR AT ABB :   ON
```

| Item | Setting | Description |
|---|---|---|
| MANUAL R | Press the rotary encoder to execute the operations. | Perform the RPN correction manually for each channel. (Refer to Section 2-4.) |
| MANUAL G | | |
| MANUAL B | | |
| APR AT ABB | ON, OFF | Turns ON/OFF the APR (automatic RPN correction) during black balance automatic adjustment. |

### SETTING 1 page

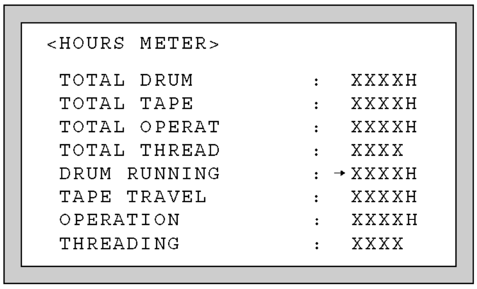


```
<SETTING 1>

 CC A COLOR : →3200
 CC B COLOR :  3200
 CC C COLOR :  4300
 CC D COLOR :  6300
```

| Item | Setting | Description |
|---|---|---|
| CC A COLOR | 3200 to 9900 | Sets according to the color temperature of the CCD filters (A, B, C, D). |
| CC B COLOR | | |
| CC C COLOR | | |
| CC D COLOR | | |

## HOURS METER page



```
<HOURS METER>
 TOTAL DRUM        :  XXXXH
 TOTAL TAPE        :  XXXXH
 TOTAL OPERAT      :  XXXXH
 TOTAL THREAD      :  XXXX
 DRUM RUNNING      : →XXXXH
 TAPE TRAVEL       :  XXXXH
 OPERATION         :  XXXXH
 THREADING         :  XXXX
```

| Item | Setting | Description |
|---|---|---|
| TOTAL DRUM | XXXXH | Displays the total drum rotation time (display only). |
| TOTAL TAPE | XXXXH | Displays the total tape running time (display only). |
| TOTAL OPERAT | XXXXH | Displays the total conduction time (display only). |
| TOTAL THREAD | XXXX | Displays the total number of threadings (display only). |
| DRUM RUNNING | XXXXH | Displays the drum rotation time and customer resets [a] |
| TAPE TRAVEL | XXXXH | Displays the tape running time and customer resets [a] |
| OPERATION | XXXXH | Displays the conduction time and customer resets [a] |
| THREADING | XXXXH | Displays the total number of threadings and customer resets [a] |

a) When the rotary encoder is pressed, blinks the confirmation message “CLEAR OK?”. And pressed it again, it will be cleared to 0.

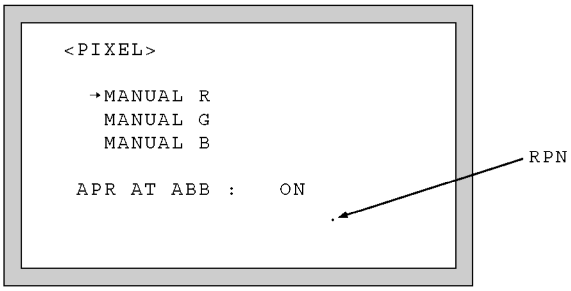
## 2-4. Manual RPN Correction

The CCD RPN (Residual Point Noise) is concealed automatically (APR) while the automatic black balance adjustment (ABB) is being executed.
For the RPN which cannot be concealed by APR, perform the manual RPN concealment as the following procedures.

**Note**

Depending on the RPN position, in some cases RPN can not be concealed even by concealing manually.

1. Set “DETAIL” to “OFF” on the SW STATUS page of the PAINT menu. (Refer to Section 4-4 of the maintenance manual part 1.)
2. Display the PIXEL page of the SERVICE menu. (Refer to Section 2-3.)
3. Move the “→” to “MANUAL, R, G, or B” depending on the RPN color, and press the rotary encoder.



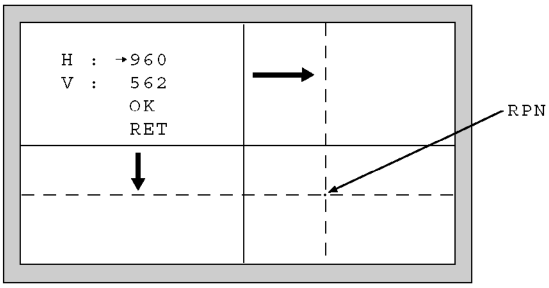
APR AT ABB : ON

**PIXEL page**

4. The cursor selection page is displayed as shown below.
   Adjust the vertical and horizontal lines of the cross-shaped cursor to the RPN by changing the H and V values.
   Changing the H value moves the vertical line of the cross-shaped cursor while changing the V value moves the horizontal line of the cross-shaped cursor.

   **Note**

   If the cross-shaped cursor lines and characters of the setting overlap, the characters will automatically move to the opposite side of the cursor line.
   Then, the RPN will not be hidden by the characters of the setting.



H : →960
V : 562

(H, V setting range)
H: 0 (Left) to 1920 (Right)
V: 0 (Top) to 1125 (Bottom)

**Cursor selection page**

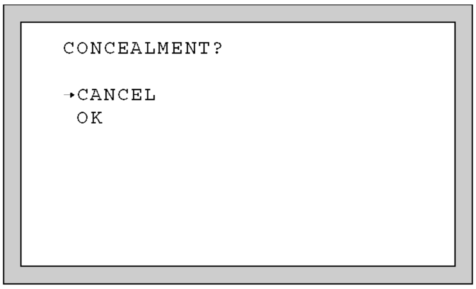
5. Move the “→” to “OK” and press the rotary encoder.
   Select the “RET” to cancel the concealment and return to PIXEL page.

6. Temporary concealment is executed and the concealment determination page (CONCEALMENT?) will be displayed as shown below.
   After RPN disappears, move the "→" to "OK" and press the rotary encoder.

   **Note**

   If "OK" is executed other than the RPN position, the erroneous data is stored. This erroneous data alone cannot be deleted.
   Before pressing the rotary encoder, be sure to check the RPN is disappeared.

   RPN concealment will be executed, and the PIXEL page will automatically be returned.
   If RPN still appears, move the "→" to "CANCEL", press the rotary encoder and repeat from step 4.



```
CONCEALMENT?

→CANCEL
 OK
```

**Concealment determination page**

7. Set the "DETAIL" of the SW STATUS page in the PAINT menu to "ON".
   (Refer to Section 4-4 of the maintenance manual part 1.)

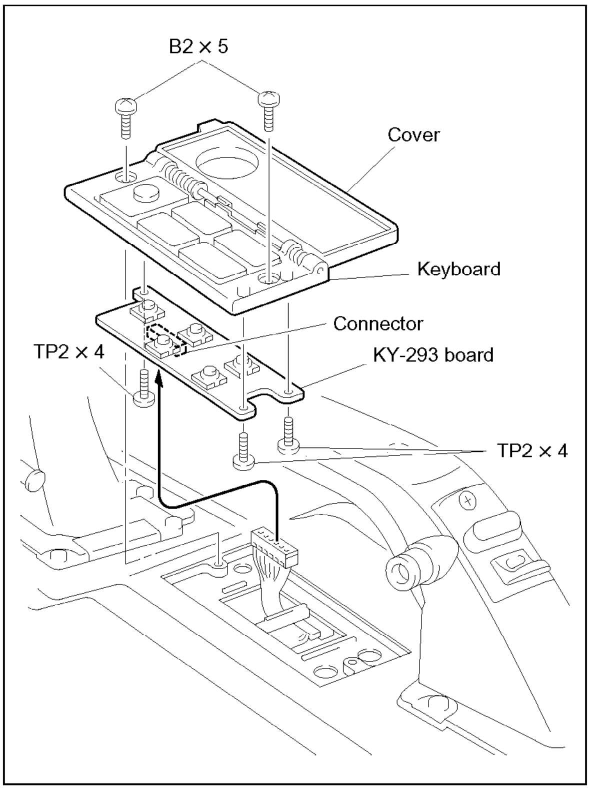
# Section 3
# Replacement of Parts

## 3-1. Replacing Boards

### 3-1-1. KY-293 Board

**Removal**

1. Open the cover of the keyboard.
2. Remove the two screws, and disconnect connector of the KY-293 board.
3. Remove the three screws, and remove the KY-293 board from the keyboard.



**Installation**

Install in the reverse order of removal.

### 3-1-2. MA-92 Board

**Note**

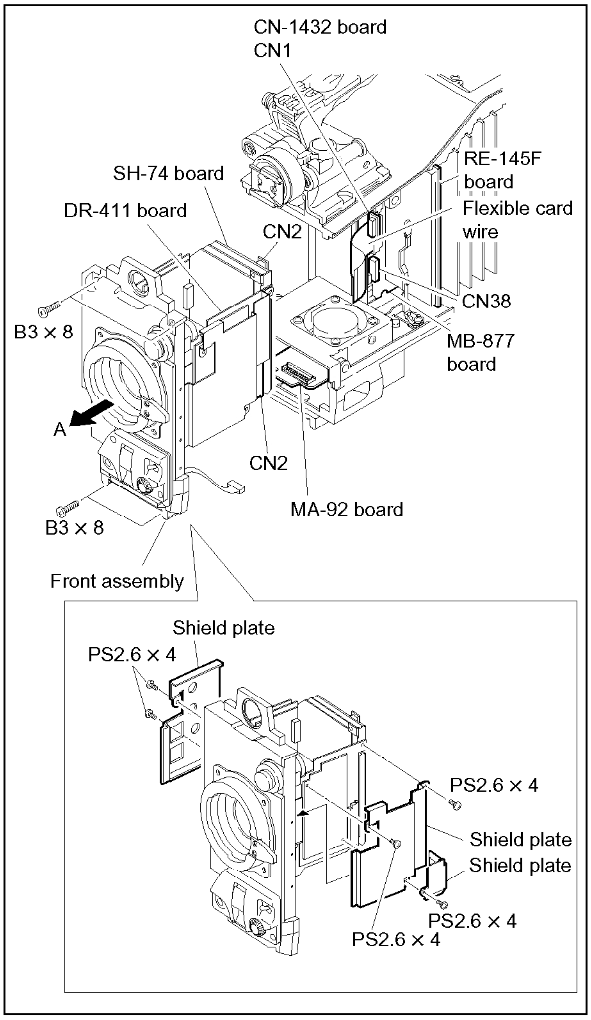
Handle the flexible card wires carefully as they break easily. (Refer to Section 1-3.)

**Removal**

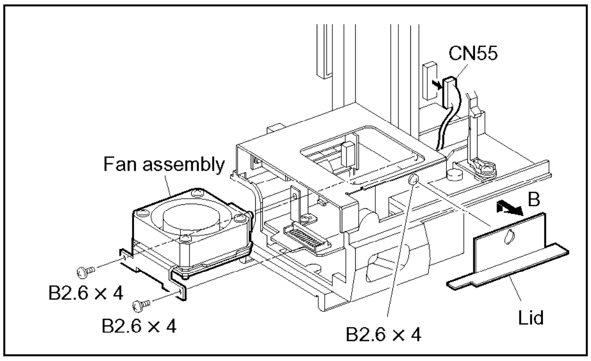
1. Remove the front lid and outside panel.
(Refer to Section 2-4 of the maintenance manual part 1.)
2. Open the inside panel.
(Refer to Section 2-4 of the maintenance manual part 1.)
3. Remove the RE-145F board.
(Refer to Section 2-5-5 of the maintenance manual part 1.)

(Continued)

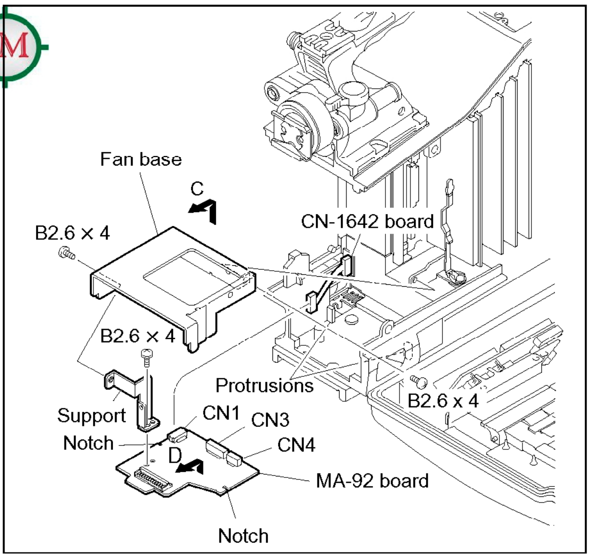
4. Remove the five screws and remove the three shield plates (right and left).
5. Disconnect the flexible card wire from CN2 of the DR-411 board.
6. Disconnect CN1 on the CN1432 board from CN2 on the SH-74 board.
7. Disconnect CN38 on the MB-877 board.
8. Remove the four screws, and remove the front assembly in arrow direction A.
   (The SW-911 board is connected by a connector to MA-92 board.)


CN-1432 board
CN1
SH-74 board
DR-411 board
CN2
RE-145F board
Flexible card wire
CN38
MB-877 board
B3 × 8
A
CN2
MA-92 board
B3 × 8
Front assembly
Shield plate
PS2.6 × 4
PS2.6 × 4
Shield plate
Shield plate
PS2.6 × 4
PS2.6 × 4

9. Disconnect CN55 on the MB-877 board.
10. Loosen the screw and remove the lid in the arrow direction B.
11. Remove the two screws, and remove the fan assembly.


CN55
Fan assembly
B
B2.6 × 4
B2.6 × 4
B2.6 × 4
Lid

12. Remove the two screws, and remove the fan base in arrow direction C.
13. Disconnect CN3 and CN4 on the MA-92 board.
14. Remove the screw securing the support, and disconnect CN1. And then, pull out the MA-92 board in the arrow direction D.


Fan base
C
B2.6 × 4
CN-1642 board
B2.6 × 4
Protrusions
Support
CN1
CN3
B2.6 x 4
Notch
D
CN4
MA-92 board
Notch

## Installation

Install in the reverse order of removal.

**Notes**

- When installing the MA-92 board, insert the two protrusions of the bottom frame into the two notches on the board.
- When installing the front assembly, connect the connectors on the SW-911 and MA-92 boards securely.

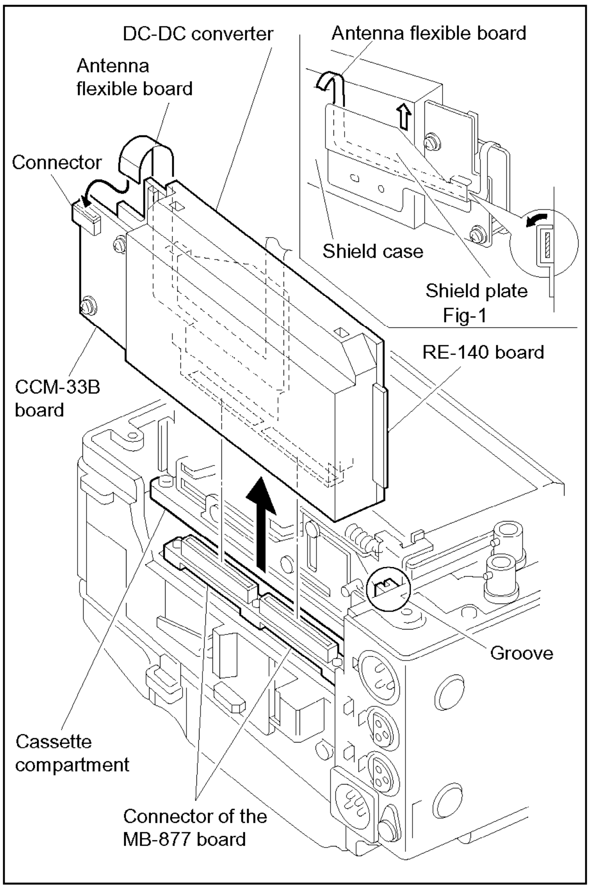
## 3-1-3. CCM-33B Board

**Note**

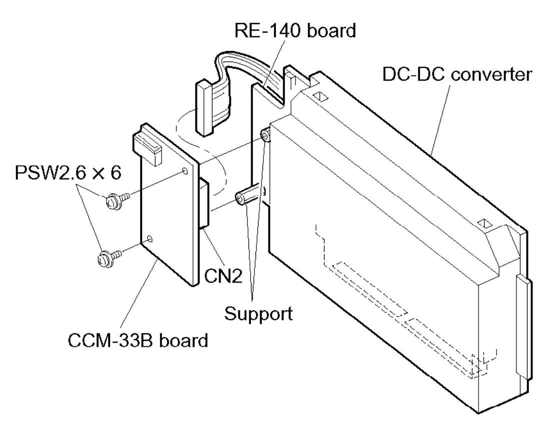
Handle the flexible card wires carefully as they break easily. (Refer to Section 1-3.)

### Removal

1. Remove the front lid and outside panel. (Refer to Section 2-4 of the maintenance manual part 1.)
2. Disconnect the antenna flexible board from the connector on the CCM-33B board.
3. Extract the antenna flexible board from the gap between the shield case of the DC-DC converter and the shield plate. (Refer to Figure 1.)
4. Remove the DC-DC converter in the arrow direction.


DC-DC converter
Antenna flexible board
Antenna flexible board
Connector
Shield case
Shield plate
Fig-1
RE-140 board
CCM-33B board
Groove
Cassette compartment
Connector of the MB-877 board

5. Remove the two screws of the DC-DC converter, and remove the CCM-33B board.
6. Disconnect CN2 on the CCM-33B board.


RE-140 board
DC-DC converter
PSW2.6 × 6
CN2
Support
CCM-33B board

### Installation

Install in the reverse order of removal.

**Note**

When installing the DC-DC converter, take care about the direction, and insert the RE-140 board along the groove of the chassis. Confirm the DC-DC converter is surely installed in the unit.

## 3-2. Replacing Boards inside Connector Box

**Notes**

- Perform the board removal/installation inside the connector box with the battery pack removed.
- After installing the connector box, perform tape running adjustment and video tracking adjustment.
  (Refer to Sections 4-2-2 and 4-2-3.)

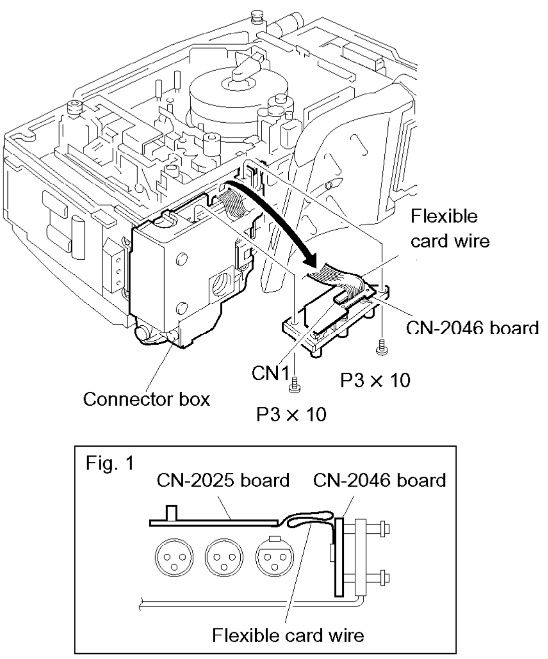
### 3-2-1. CN-2046 Board

**Note**

Handle the flexible card wires carefully as they break easily. (Refer to Section 1-3.)

#### Removal

1. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
2. Remove the two screws, and open the CN-2046 board in the arrow direction.
3. Disconnect the flexible card wire from CN1 on the CN-2046 board.


Flexible card wire
CN-2046 board
CN1
P3 x 10
Connector box
P3 x 10
Fig. 1
CN-2025 board
CN-2046 board
Flexible card wire

#### Installation

Install in the reverse order of removal.

**Note**

Fold the flexible card wire as shown in Fig.1.

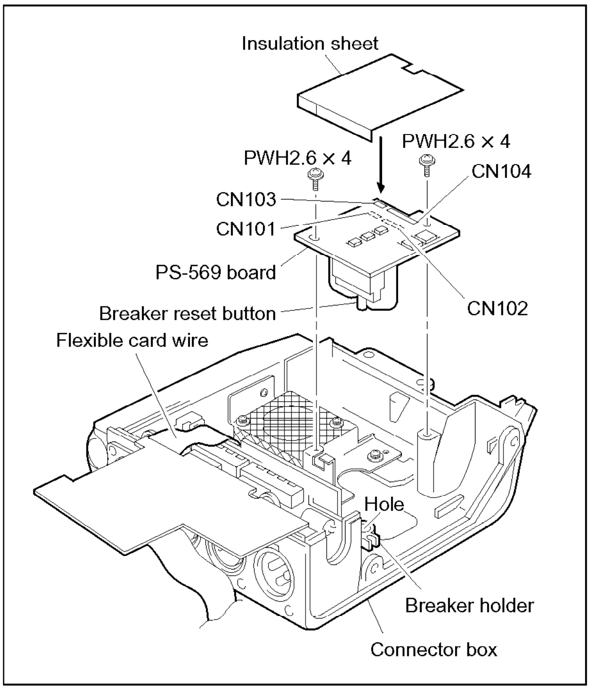
## 3-2-2. PS-569 Board

**Notes**

- As the breaker holder is not secured, be careful not to lose it.
- Handle the flexible card wires carefully as they break easily. (Refer to Section 1-3.)

### Removal

1. Remove the connector box. (Refer to Section 1-4.)
2. Remove the CN-2046 board. (Refer to Section 3-2-1.)
3. Disconnect the two connectors on the CN-2025 board and open it in the arrow direction.
   (Refer to Section 3-2-3.)
4. Remove the insulation sheet.
5. Remove the two screws securing the PS-569 board.
6. Disconnect the four connectors (CN101 to CN104) on the PS-569 board, and remove the PS-569 board.


Insulation sheet
PWH2.6 × 4
PWH2.6 × 4
CN104
CN103
CN101
PS-569 board
Breaker reset button
CN102
Flexible card wire
Hole
Breaker holder
Connector box

### Installation

7. Connect the four connectors (CN101 to CN104) to the PS-569 board.
8. Insert the breaker reset button on the PS-569 board into the hole of the breaker holder of the connector box, and secure the board with the two screws.
9. Install in the reverse order of steps 1 to 4 of removal.

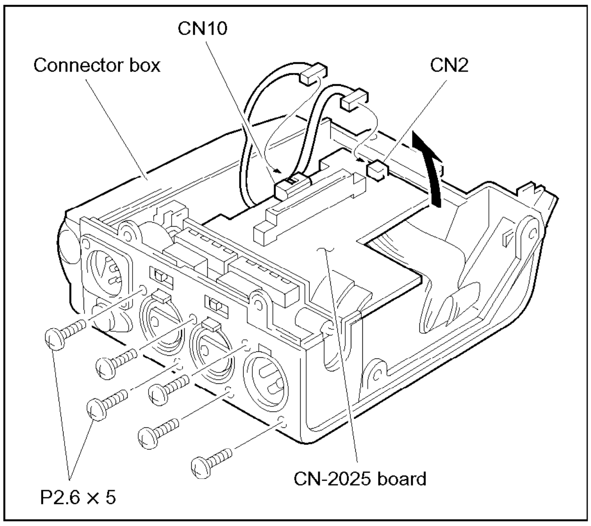
## 3-2-3. CN-2025 Board

**Note**

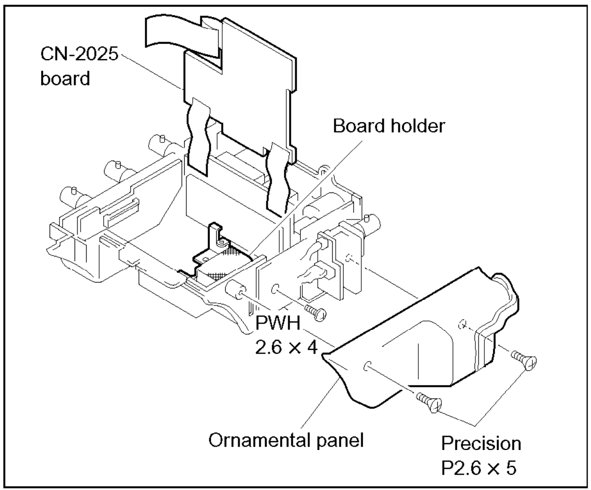
Handle the flexible card wires carefully as they break easily. (Refer to Section 1-3.)

### Removal

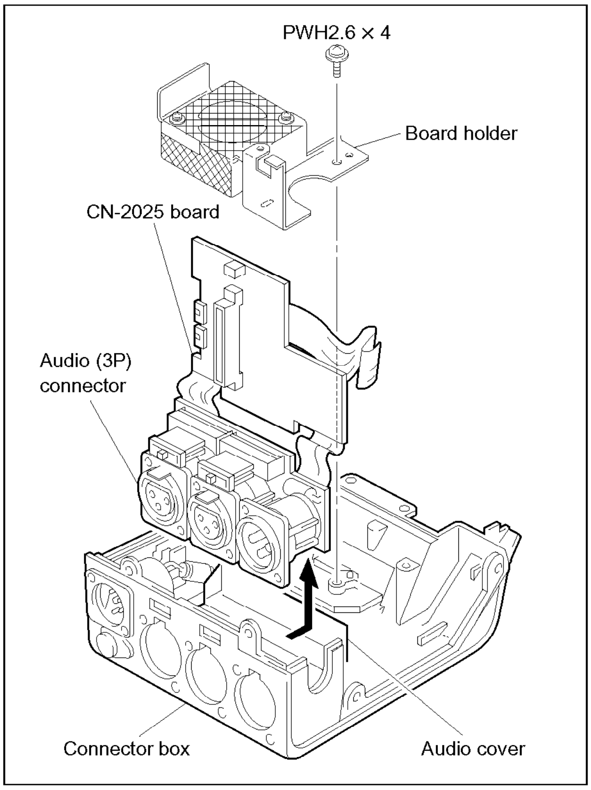
1. Remove the connector box. (Refer to Section 1-4.)
2. Remove the CN-2046 board. (Refer to Section 3-2-1.)
3. Disconnect the two connectors (CN2 and CN10) on the CN-2025 board.
4. Remove the six screws, and raise the CN-2025 board in the arrow direction.
5. Remove the PS-569 board. (Refer to Section 3-2-2.)


CN10
Connector box
CN2
P2.6 × 5
CN-2025 board

6. Remove the two precision screws of the ornamental panel, and remove a screw (PWH2.6 × 4) of the board holder inside.


CN-2025 board
Board holder
PWH 2.6 × 4
Ornamental panel
Precision P2.6 × 5

7. Remove the screw and remove the board holder.
8. Remove the CN-2025 board in the arrow direction.


PWH2.6 × 4
Board holder
CN-2025 board
Audio (3P)
connector
Connector box
Audio cover

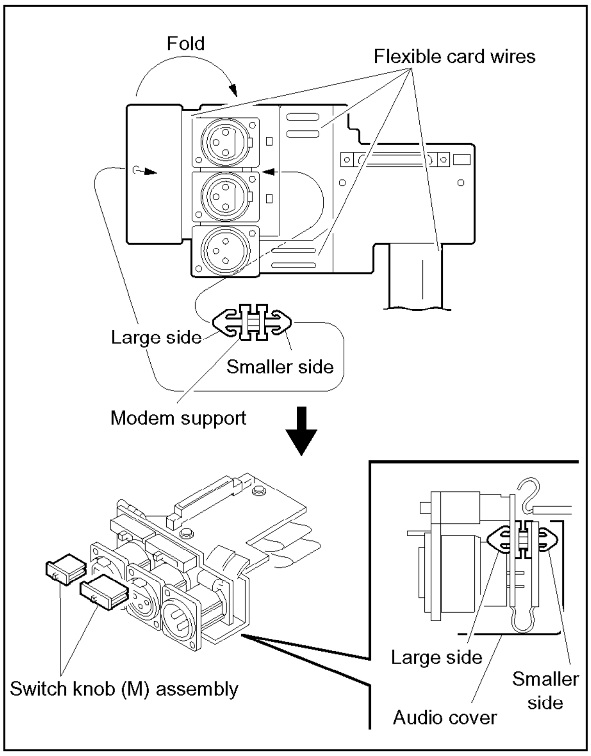
## Installation

Attatch in the reverse order of removal.

**Notes**

- The audio cover is located under the audio (3P) connector and the CN-2025 board.
- Remove the modem support and switch knob (M) assembly from the old board, and then install them to a new CN-2025 board.

1. Install in the reverse order of steps 1 to 8 of removal.


Fold
Flexible card wires
Large side
Smaller side
Modem support
Switch knob (M) assembly
Large side
Smaller
side
Audio cover

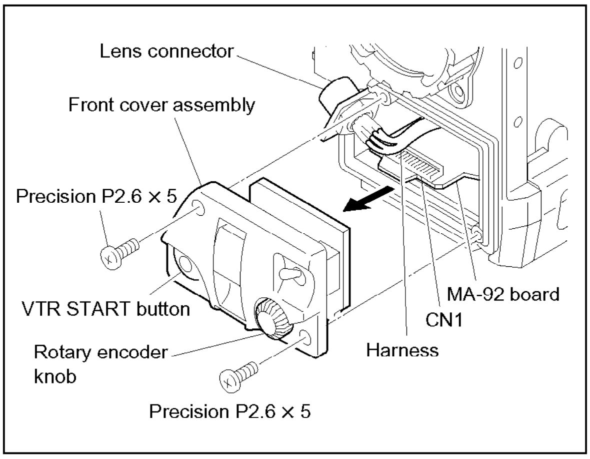
## 3-3. Replacing Switches of SHUTTER and AUTO W/B BAL

**Note**

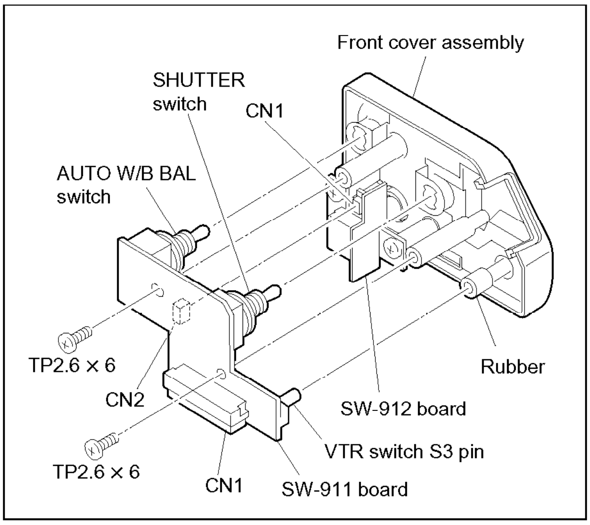
During the front cover assembly removal/installation, make sure that the board does not get caught by the lens connector and harness.

### Removal

1. Remove the two screws, and remove the front cover assembly in the arrow direction.


Lens connector
Front cover assembly
Precision P2.6 x 5
VTR START button
Rotary encoder knob
Precision P2.6 x 5
MA-92 board
CN1
Harness

2. Remove the two screws, and remove the SW-911 board from the front cover.
3. Desolder the SHUTTER switch and AUTO W/B BAL switch from the SW-911 board.


Front cover assembly
SHUTTER switch
CN1
AUTO W/B BAL switch
TP2.6 x 6
CN2
TP2.6 x 6
CN1
Rubber
SW-912 board
VTR switch S3 pin
SW-911 board

### Installation

4. Solder the SHUTTER switch and AUTO W/B BAL switch to the SW-911 board.
5. Insert the two switches of the SW-911 board into the holes on the front assembly cover and insert the pin of the VTR switch (S3) into the rubber.
6. Connect CN2 on the SW-911 board to CN1 on the SW-912 board.
7. Attach the SW-911 board to the front cover assembly using the two screws.
   After attaching it, press the VTR START switch and check the click sound.
8. Adjust the position of CN1 on the SW-911 board to CN1 on the MA-92 board, and insert the front cover assembly carefully.
9. Install the front cover assembly using the two screws.

## 3-4. Replacing Rotary Encoder

**Note**

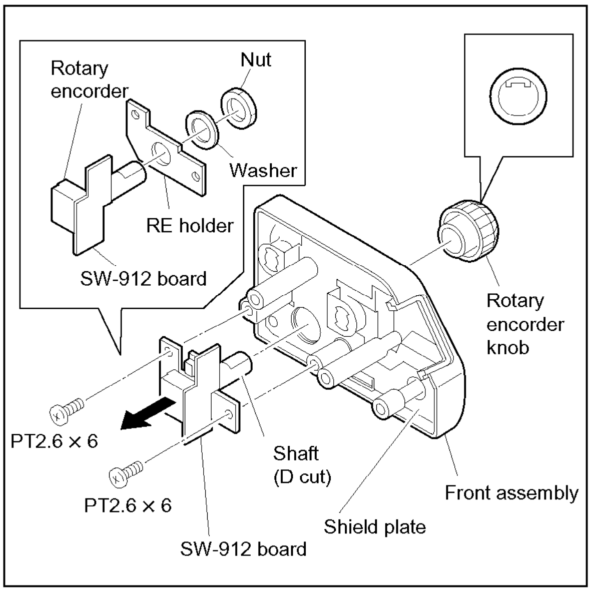
During the front cover assembly removal/installation, make sure that the board does not get caught by the lens connector and harness.

### Removal

1. Remove the two screws, and remove the front cover assembly. (Refer to Section 3-3.)
2. Remove the SW-911 board. (Refer to Section 3-3.)
3. Remove the two screws, and pull the SW-912 board in the arrow direction.

   **Note**

   Remove the rotary encoder knob beforehand.
4. Remove the nut and the washer, and remove the rotary encoder from the RE holder.


Rotary encoder
Nut
Washer
RE holder
SW-912 board
Rotary encorder knob
PT2.6 × 6
PT2.6 × 6
Shaft (D cut)
Front assembly
Shield plate
SW-912 board

### Installation

Install in the reverse order of removal.

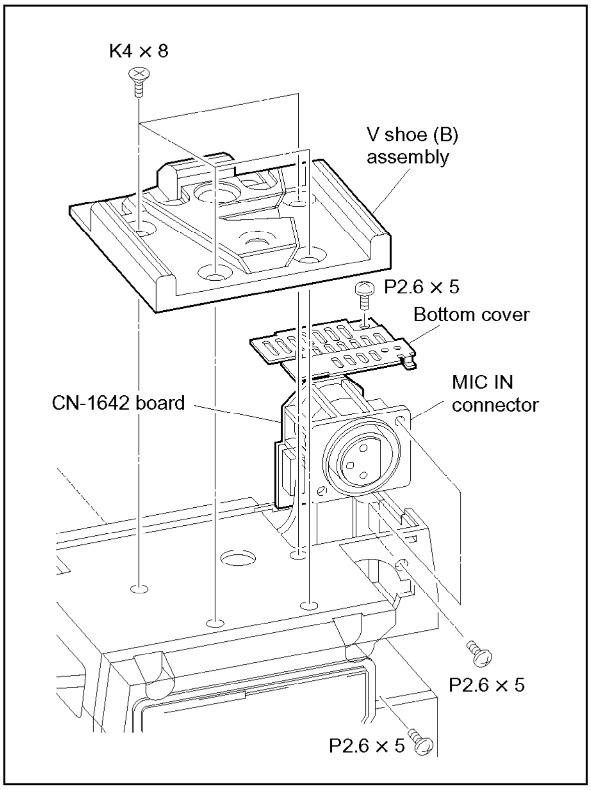
**Note**

When installing the rotary encoder knob, adjust the position of the knob to the D-cut of the shaft on the SW-912 board.

## 3-5. Replacing MIC IN Connector

### Removal

1. Remove the four screws, and remove the V shoe (B) assembly.
2. Remove the screw, and remove the bottom cover.
3. Remove the two screws, disconnect the connector, and remove the CN-1642 board.


K4 × 8
V shoe (B) assembly
P2.6 × 5
Bottom cover
CN-1642 board
MIC IN connector
P2.6 × 5
P2.6 × 5

### Installation

Install in the reverse order of removal.

# 3-6. Replacing CCD Block and Component Parts

## 3-6-1. CCD Block Replacement

**WARNING**

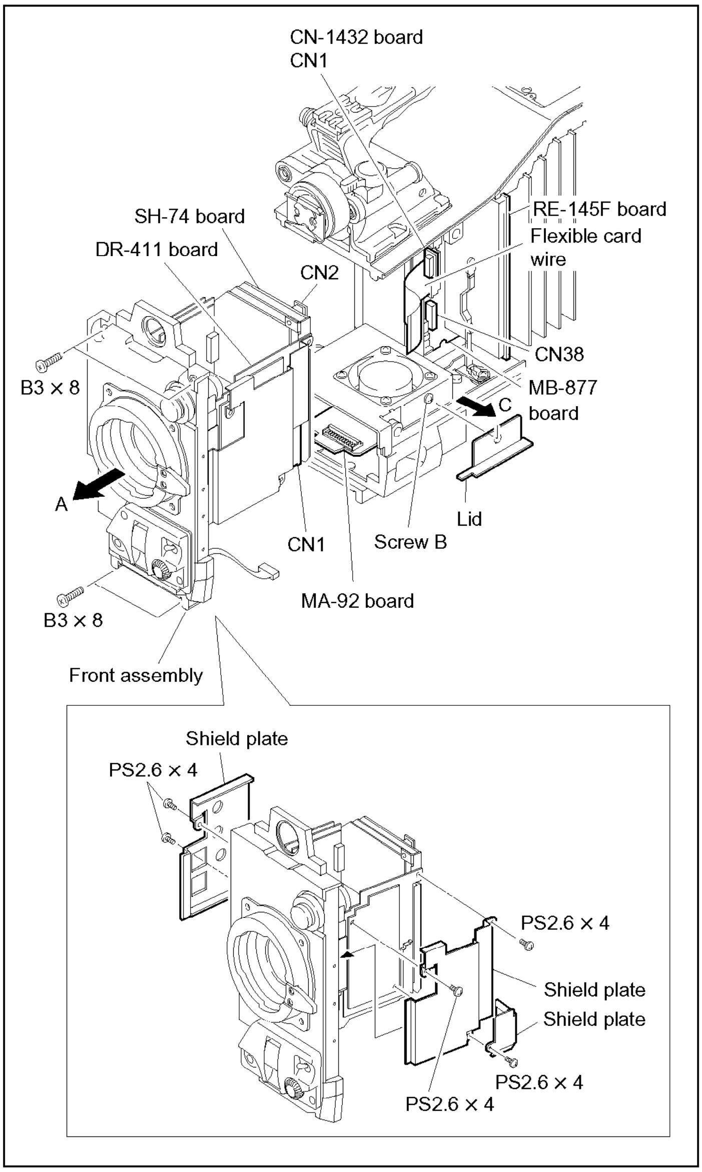
Removing or installing the CCD block with the power connected may result in short-circuiting or electric hazards when internal harnesses for connecting and other boards are touched. When installing the CCD block to the camera, turn off the power switch, and disconnect the cables connected to the DC IN connector. If the battery is attached, remove the battery, too.

### Tools

| | |
|---|---|
| • L wrench (Width across 0.89 mm) : | 7-700-736-06 |
| • L wrench (Width across 2.5 mm) : | 7-700-736-04 |

### Removal

1. Remove the front lid and outside panel. (Refer to Section 2-4. of the maintenance manual part 1)
2. Loosen the four screws of the inside panel completely, and open. (Refer to Section 2-4. of the maintenance manual part 1)
3. Remove the RE-145F board.
4. Remove the five screws, and remove the three shield plates at right and left sides.
5. Disconnect the flexible card wire from CN1 on the DR-411 board.
6. Disconnect CN1 on the CN1432 board from CN2 on the SH-74 board.
7. Disconnect CN38 on the MB-877 board.
8. Loosen screw B and remove the lid in arrow


CN-1432 board
CN1
SH-74 board
DR-411 board
CN2
RE-145F board
Flexible card wire
CN38
MB-877 board
C
B3 x 8
A
Lid
CN1
Screw B
MA-92 board
B3 x 8
Front assembly
Shield plate
PS2.6 x 4
PS2.6 x 4
Shield plate
Shield plate
PS2.6 x 4
PS2.6 x 4

10. Remove the four fixing screws, and remove the ND filter and CC filter knob.

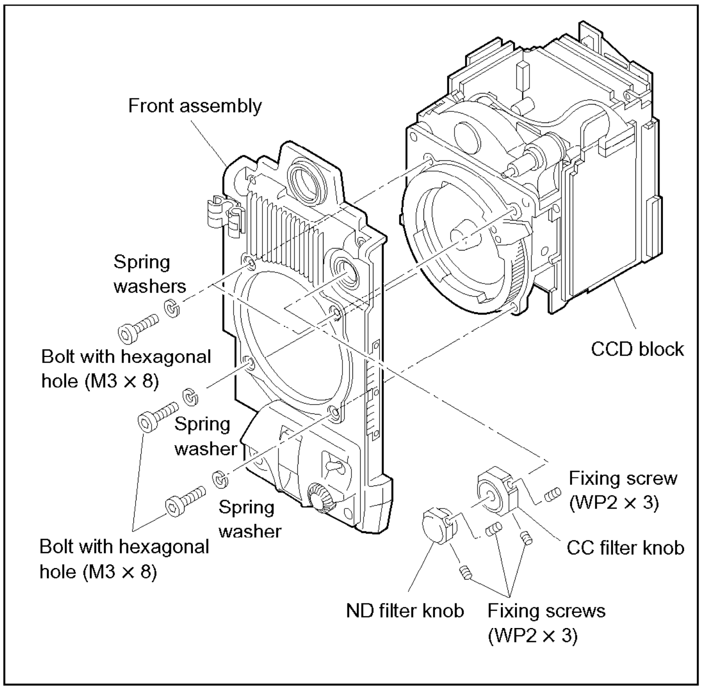
11. Remove the four bolts with hexagonal holes and four spring washers, and remove the CCD block from the front assembly.

**Note**

It is recommended that the filter disk unit be attached and removed in a clean room.

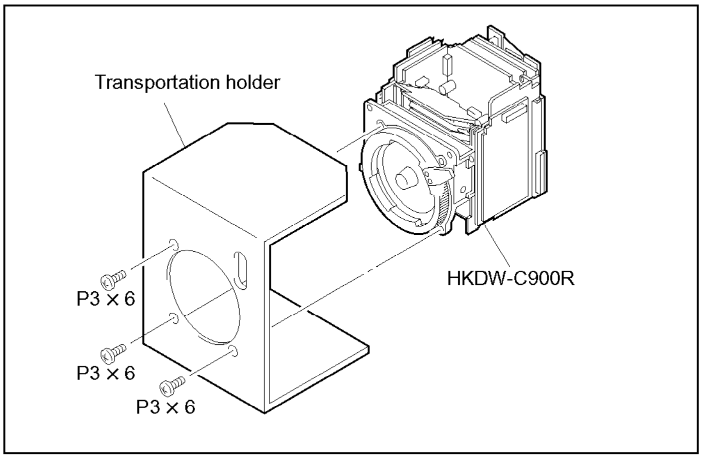
12. Disconnect CN2 on the CN-1614 board.

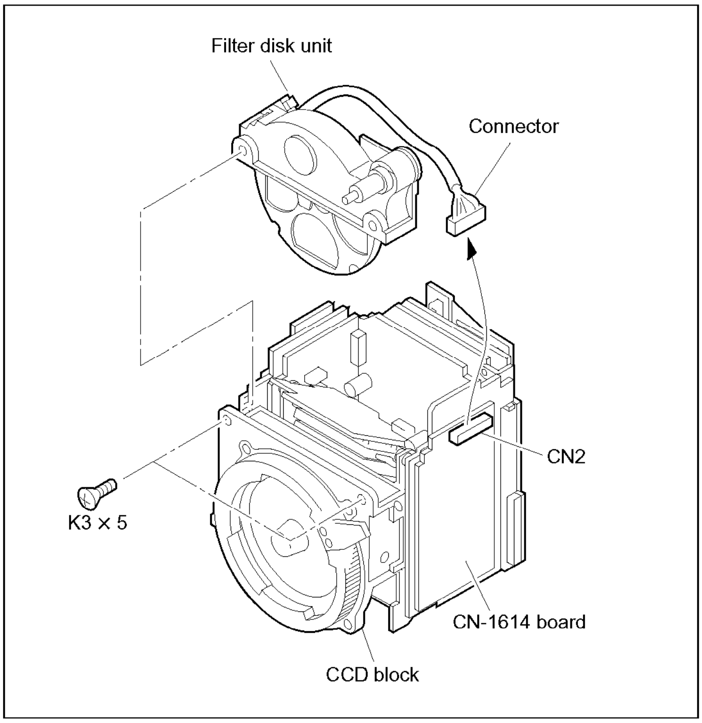
13. Remove the two screws, pull out the filter disk unit slowly, and remove the CCD block.


Front assembly
Spring washers
Bolt with hexagonal hole (M3 x 8)
Spring washer
Spring washer
Bolt with hexagonal hole (M3 x 8)
CCD block
Fixing screw (WP2 x 3)
CC filter knob
ND filter knob
Fixing screws (WP2 x 3)

## Installation

14. Remove the three screws to remove the transportation holder from the HKDW-C900R of the repair CCD unit.


Transportation holder
HKDW-C900R
P3 x 6
P3 x 6
P3 x 6



15. Attach the filter disk unit to the HKDW-C900R using the two screws.

    **Notes**

    - When attaching, do not touch the surface of the filter disk unit.
    - Be sure remove the dust cover from the HKDW-C900R previously.

16. Connect the connector protruding out from the filter disk unit to CN2 on the CN-1614 board.

    **Note**

    If using the filter disk servo unit, replace the CN-1614 board with the board provided.

17. Attach the CCD block to the front assembly using the four bolts with hexagonal holes and spring washers.

    Tightening torque : $110 \times 10^{-2}$ N•m
    {11 kgf•cm}

18. Install the ND and the CC filter knobs. (Refer to Section 1-12.)

19. Install in the reverse order of steps 1 through 9 of removal.

## Adjustments after replacement

20. Perform the setting menu as follows.

    MAINTENANCE menu → AUTO SETUP page → AUTO LEVEL

## 3-6-2. Board Replacement inside CCD Block

**Note**

Before performing the board replacement inside the CCD block, be sure to remove the front assembly from the unit.

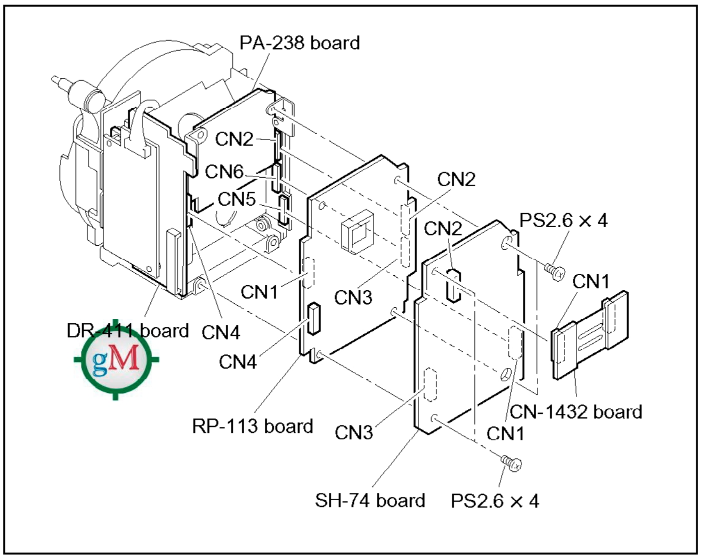
---

### Removal

1. Remove the front assembly from the unit. (Refer to Section 3-6-1.)

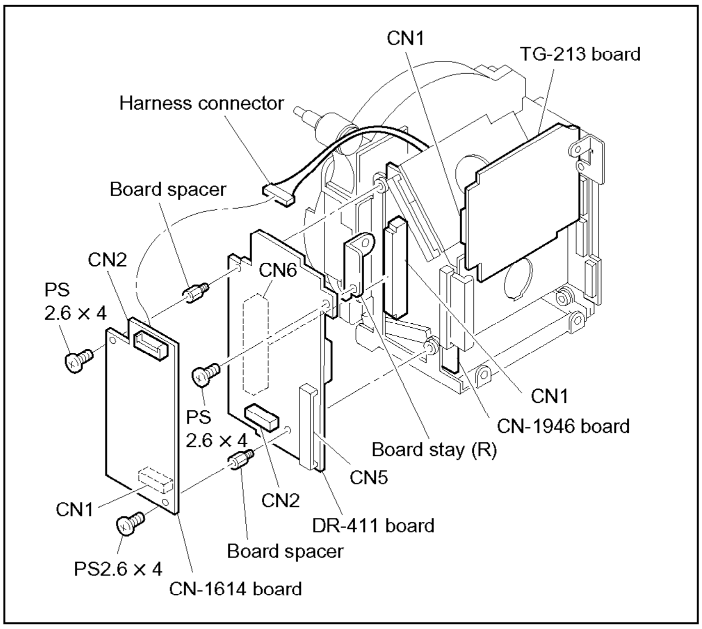
#### CN-1432/SH-74/RP-113 Board Removal

2. Disconnect CN1 on the CN1432 board from CN2 on the SH-74 board, and remove the CN-1432 board.
3. Remove the four screws securing the SH-74 board.
4. Disconnect CN3 and CN1 on the SH-74 board from CN4 on the RP-113 board and CN5 on the PA-238 board, and remove the SH-74 board.
5. Disconnect CN1, CN2 and CN3 on the RP-113 board from CN4 on the DR-411 board, and CN2 and CN6 on the PA-238 board, and remove the RP-113 board.


PA-238 board
CN2
CN6
CN5
CN2
CN2
PS2.6 × 4
CN1
CN1
CN3
DR-411 board
CN4
CN4
RP-113 board
CN3
CN-1432 board
CN1
SH-74 board
PS2.6 × 4

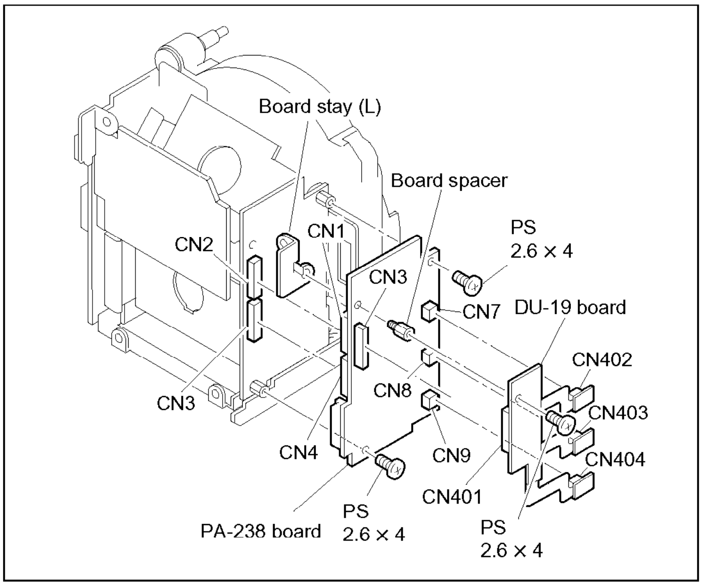
#### CN-1614/DR-411 Board Removal

6. Disconnect the harness connector of the filter disk unit from CN2 on the CN-1614 board.
7. Disconnect CN1 on the CN-1614 board from CN2 on the DR-411 board, and remove the CN-1614 board.
8. Remove the two board spacers securing the DR-411 board.
9. Disconnect CN6 and CN5 on the DR-411 board from CN1 on the CN-1946 board of the prism block, and CN1 on the TG-213 board, and remove the DR-411 board.
10. Remove a screw, and remove the board stay (R) from the DR-411 board.

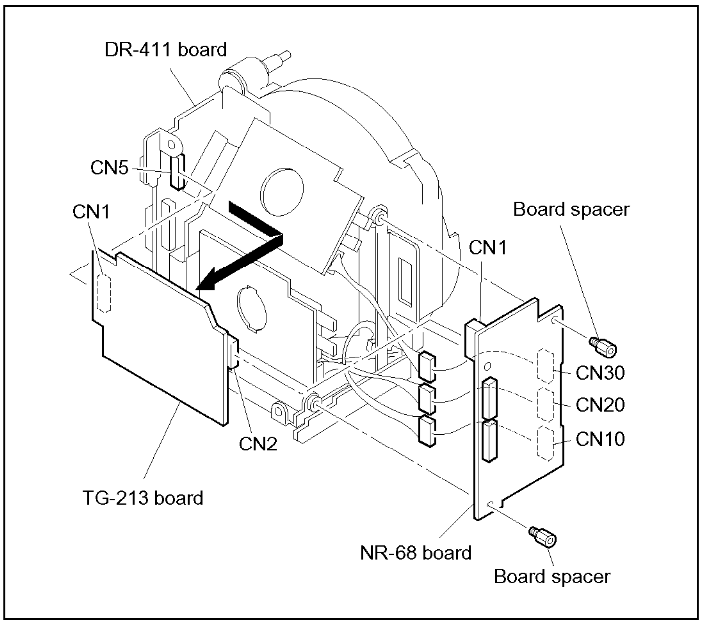

CN1
TG-213 board
Harness connector
Board spacer
CN2
CN6
PS
2.6 × 4
PS
2.6 × 4
CN1
CN-1946 board
Board stay (R)
CN5
CN1
CN2
DR-411 board
Board spacer
PS2.6 × 4
CN-1614 board

### DU-19/PA-238/NR-68/TG-213 Board Removal

11. Remove a screw securing the DU-19 board.
12. Disconnect CN401 through CN404 on the DU-19 board from the four connectors (CN3, CN7 to CN9) on the PA-238 board, and remove the DU-19 board.
13. Remove the two screws securing the PA-238 board.


Board stay (L)
Board spacer
PS
2.6 × 4
CN2
CN1
CN3
CN7
DU-19 board
CN402
CN8
CN403
CN3
CN4
CN9
CN404
CN401
PS
PA-238 board
2.6 × 4
PS
2.6 × 4

14. Disconnect CN1 and CN4 on the PA-238 board from CN2 and CN3 on the NR-68 board, and remove the PA-238 board.
15. Remove a board spacer, and remove the board stay (L) from the PA-238 board.
16. Remove the two board spacers securing the NR-68 board.
17. Disconnect CN1 on the NR-68 board from CN2 on the TG-213 board.
18. Disconnect the harness connectors from CN10, CN20 and CN30 on the NR-68 board, and remove the NR-68 board.
19. Disconnect CN1 on the TG-213 board from CN5 on the DR-411 board, and remove the TG-213 board.


DR-411 board
CN5
CN1
Board spacer
CN1
CN30
CN20
CN10
CN2
TG-213 board
NR-68 board
Board spacer

### Installation

Install in the reverse order of removal.

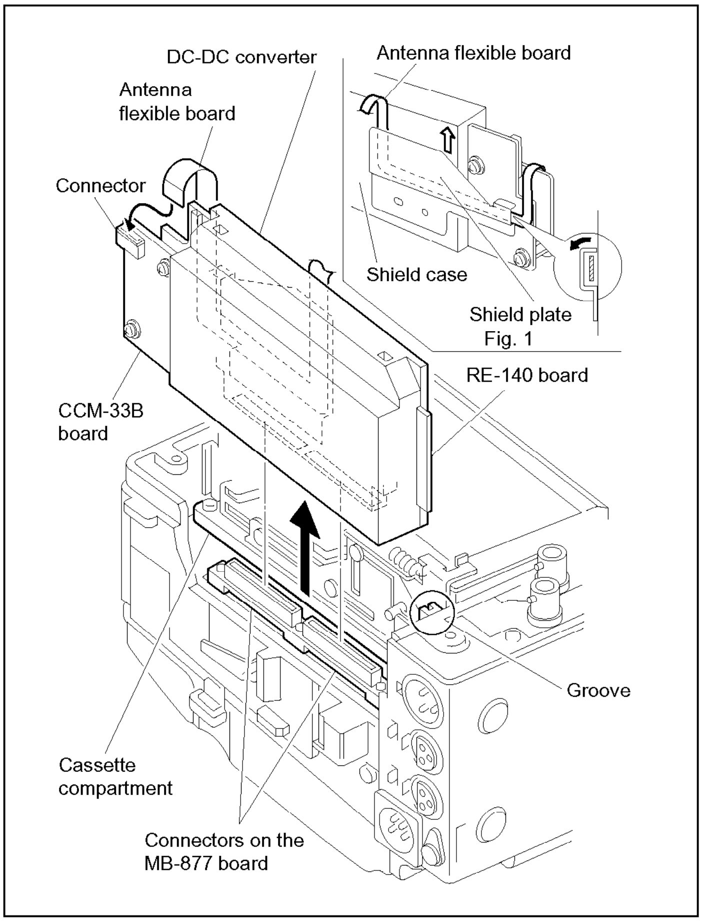
## 3-7. Replacing DC-DC Converter

**Note**

Handle the flexible card wires carefully as they break easily. (Refer to Section 1-3.)

### Removal

1. Remove the front lid and outside panel. (Refer to Section 2-4 of the maintenance manual part 1.)
2. Disconnect the antenna flexible board from the connector on the CCM-33B board.
3. Extract the antenna flexible board from the gap between the shield case of the DC-DC converter and the shield plate. (Refer to Figure 1.)
4. Remove the DC-DC converter in the arrow direction.


DC-DC converter
Antenna flexible board
Antenna
flexible board
Connector
Shield case
Shield plate
Fig. 1
RE-140 board
CCM-33B
board
Groove
Cassette
compartment
Connectors on the
MB-877 board

### Installation

Install in the reverse order of removal.

**Note**

When installing the DC-DC converter, take care about the direction, and insert the RE-140 board along the groove of the chassis. Confirm the DC-DC converter is surely installed in the unit.

## 3-8. Replacing Fan Assembly

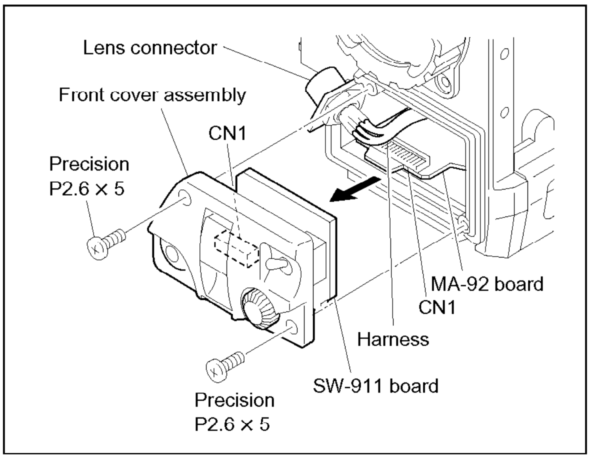
### 3-8-1. Fan Assembly (Bottom) Replacement

**Note**

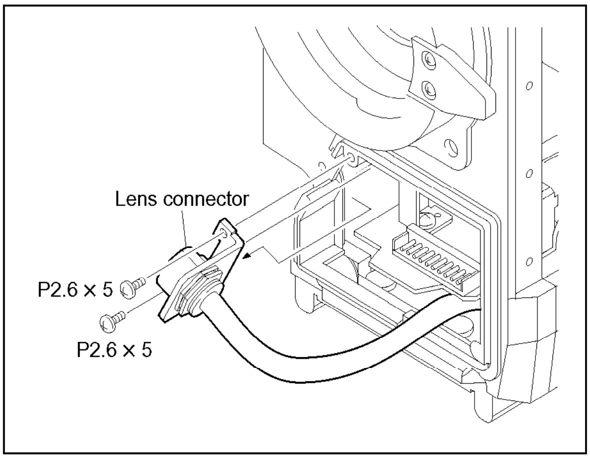
During the front cover assembly removal/installation, make sure that the board does not get caught by the lens connector and harness.

#### Removal

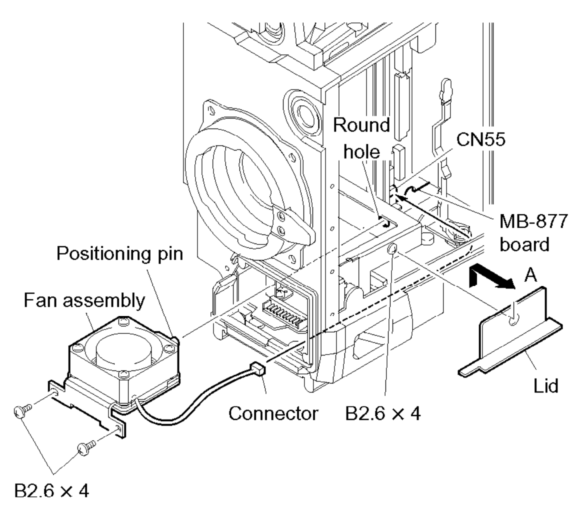
1. Remove the two screws, and remove the front cover assembly in the arrow direction.


Lens connector
Front cover assembly
CN1
Precision
P2.6 x 5
MA-92 board
CN1
Harness
SW-911 board
Precision
P2.6 x 5

2. Remove the two screws, and remove the lens connector.
   (Do not disconnect the connector at the MB-877 board side.)


Lens connector
P2.6 x 5
P2.6 x 5

3. Open the inside panel. (Refer to Section 2-4 of the maintenance manual part 1.)
4. Disconnect CN55 on the MB-877 board.
5. Loosen the screw and remove the lid in the direction A.
6. Remove the two screws and remove the fan assembly.


Round hole
CN55
MB-877 board
A
Positioning pin
Fan assembly
Lid
Connector
B2.6 x 4
B2.6 x 4

#### Installation

Install in the reverse order of removal.

**Notes**

- Pass the fan connector correctly.
- Insert the positioning pin of the fan assembly into the round hole.
- When installing the front assembly, connect the connectors on the SW-911 and MA-92 boards securely.

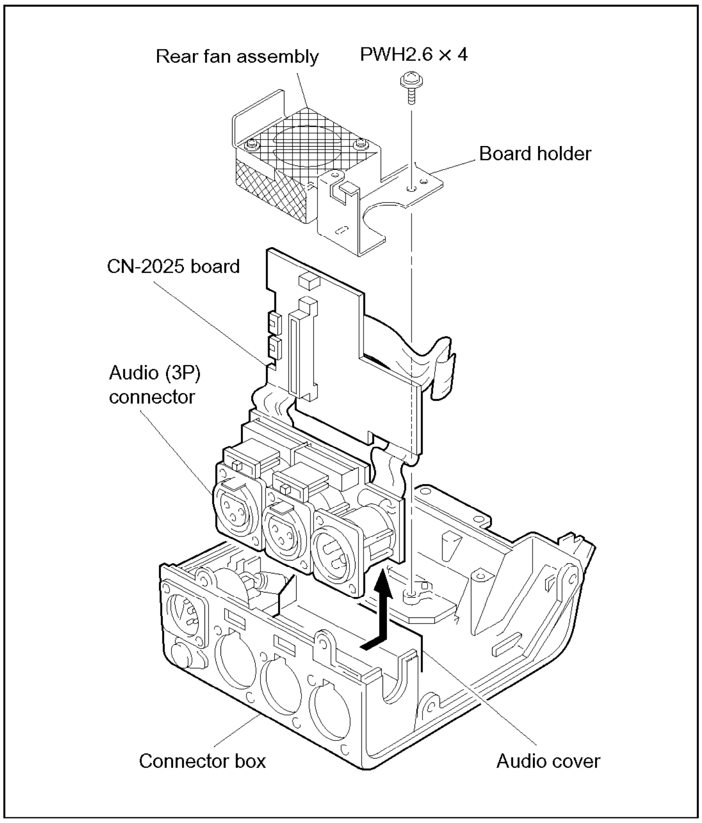
## 3-8-2. Rear Fan Assembly Replacement

**Note**

Handle the flexible card wires carefully as they break easily. (Refer to Section 1-3.)

### Removal

1. Remove the connector box.
   (Refer to Section 1-4.)
2. Remove the CN-2046 board.
   (Refer to Section 3-2-1.)
3. Remove the CN-2025 board.
   (Refer to Section 3-2-3.)
4. Remove the PS-569 board.
   (Refer to Section 3-2-2.)
5. Remove the two precision screws of the ornamental panel. (Refer to Section 3-2-3.) And then, remove a screw (PWH2.6 × 4) securing the board holder inside.
6. Remove a screw, and remove the rear fan assembly.


Rear fan assembly
PWH2.6 × 4
Board holder
CN-2025 board
Audio (3P)
connector
Connector box
Audio cover

### Installation

Install in the reverse order of removal.

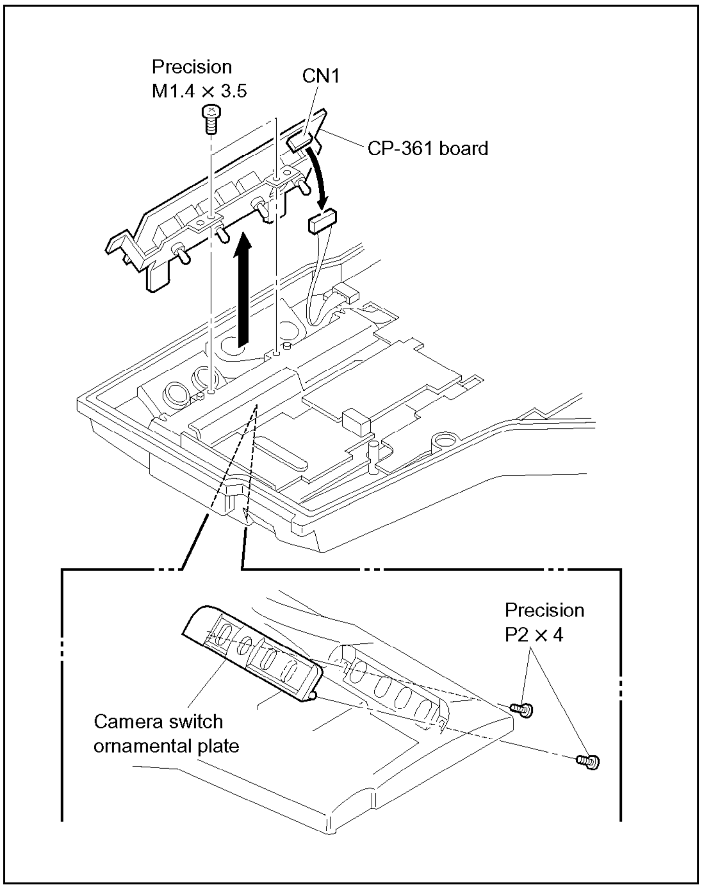
## 3-9. Replacing the Camera Switch Ornamental Plate

### Tools

- Coating (Sealant TSE392-W) : 7-432-950-03

### Removal

1. Open the inside panel. (Refer to Section 2-4 of the maintenance manual part 1)
2. Disconnect the connector from CN1 on the CP-361 board.
3. Remove the two precision screws, and remove the CP-361 board.
4. Remove the two precision screws and remove the camera switch ornamental plate.

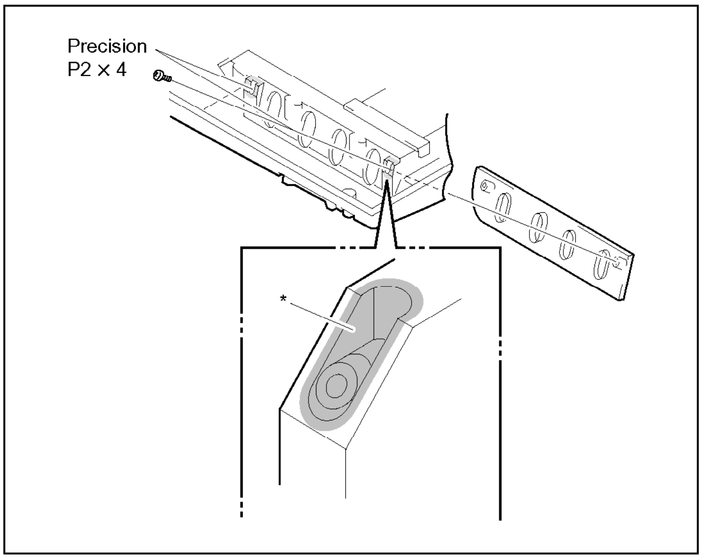

Precision
M1.4 × 3.5
CN1
CP-361 board
Precision
P2 × 4
Camera switch
ornamental plate

## Installation

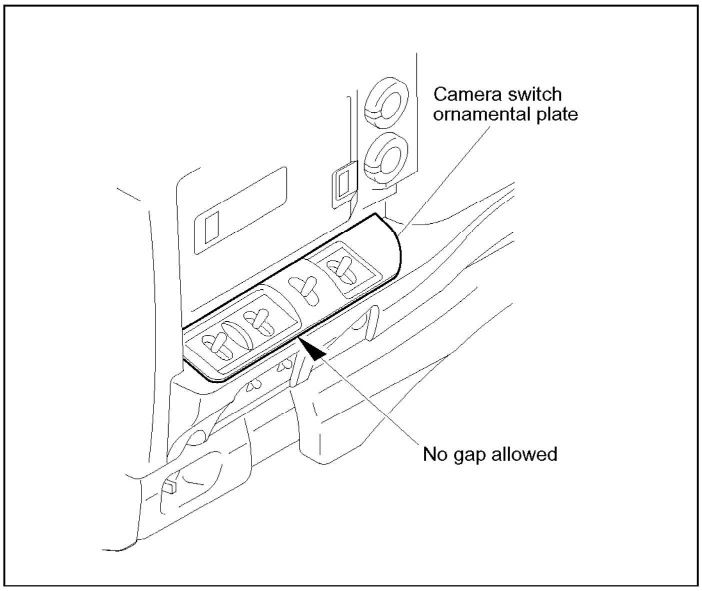
5. Remove the old coating on the inside panel with the tip of the flatblade screwdriver.
6. Adjust the camera switch ornamental plate to the installing position, and apply coating from the inside of the inside panel to all over the screw fixing support (Shaded portion).

   **Note**

   Do not let the coating enter the screw hole.



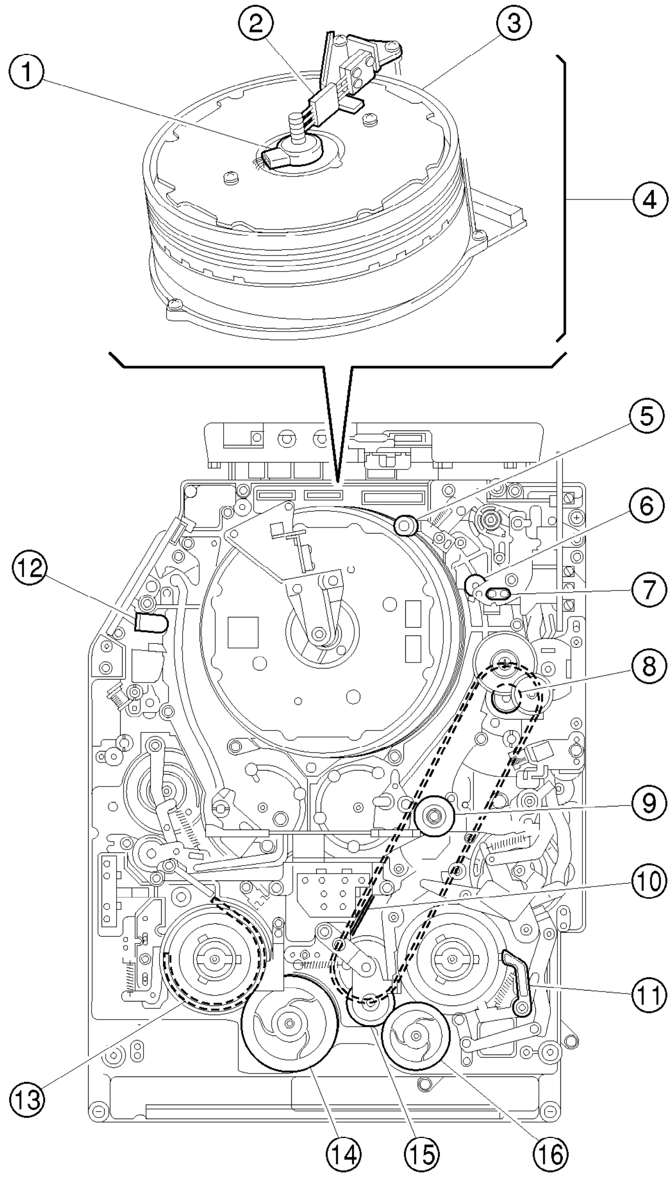
7. Attach the camera switch ornamental plate with the two screws so that there is no gap (below 0.4 mm) between the camera switch ornamental plate and panel as seen from the outside of the inside panel.
8. Install the CP-361 board and inside panel in the reverse order of steps 1 to 3 of removal.



# 3-10. Replacing Parts on Mechanical Deck

## 3-10-1. General Information on Parts Replacement and Adjustment

### 1. Index



| No. | Part Name | Section | Page |
|---|---|---|---|
| ① | Slip Ring Assembly | 3-10-7 | 3-38 |
| ② | Brush Assembly for Slip Ring | 3-10-6 | 3-35 |
| ③ | Upper Drum Assembly | 3-10-5 | 3-25 |
| ④ | Drum Assembly | 3-10-8 | 3-42 |
| ⑤ | HC Roller Assembly for Video Heads | 3-10-10 | 3-50 |
| ⑥ | CUE Brush for CUE Head Cleaning | 3-10-11 | 3-53 |
| ⑦ | CUE Head | 3-10-19 | 3-84 |
| ⑧ | Capstan Motor | 3-10-17 | 3-75 |
| ⑨ | Pinch Roller | 3-10-9 | 3-48 |
| ⑩ | Timing Belt | 3-10-16 | 3-71 |
| ⑪ | T Soft Brake Assembly | 3-10-13 | 3-59 |
| ⑫ | CTL Head | 3-10-18 | 3-80 |
| ⑬ | Brake Band Assembly | 3-10-12 | 3-55 |
| ⑭ | S Idler Assembly | 3-10-14 | 3-62 |
| ⑮ | Swing Gear Assembly | 3-10-15 | 3-65 |
| ⑯ | T Idler Assembly | 3-10-14 | 3-62 |

## 2. Screwdriver and torque reading

This model uses two kinds of screws.
Be sure to use the specified tools when loosening or tightening the screws.
Be sure to use the torque screwdriver when tightening the screws at the specified torque.

| | |
|---|---|
| Torque screwdriver bit (for M1.4) : | J-6325-110-A |
| Torque screwdriver bit (for M2) : | J-6325-380-A |
| Hexagon bit (across 1.5 mm) : | J-6326-120-A |
| Torque screwdriver (for 3 kg) : | J-6325-400-A |

Torque reading

| | |
|---|---|
| for M1.4 (+) screw : | $9 \times 10^{-2}$ N•m (0.9 kgf•cm) |
| for M2 (+) screw : | $19 \times 10^{-2}$ N•m (1.9 kgf•cm) |
| for hexagon screw : | $19 \times 10^{-2}$ N•m (1.9 kgf•cm) |

**References**

This model uses small-size screws. The screws may drop inside the unit when removed or attached.
To prevent this, it is recommended that the bit of the screwdriver be magnetized.

## 3. Stop washer

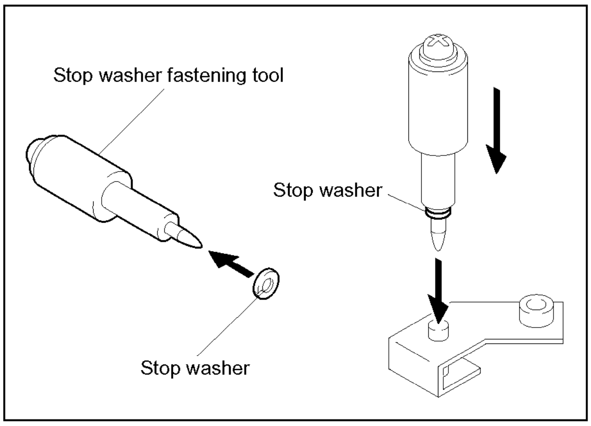
Never re-use stop washers. When attaching parts, be sure to use new stop washers.
Stop washer : 3-559-408-11

- Stop washer removal
  (a) Remove the stop washer using a pair of small diagonal (cutting) pliers or tweezers.

  **Notes**
  - Make sure that they do not drop inside the unit.
  - Make sure that the tool does not touch other parts (especially the drum).

- Stop washer installation
  When attaching the stop washer, use of the following tool is recommended.
  Stop washer fastening tool : J-6323-530-A

  (a) Insert the stop washer into the tip of the stop washer fastening tool.
  (b) Place the tip of the tool at the center of the top of the shaft in an upright position.
  (c) Press down the thick part of the tool and attach the stop washer to the shaft.

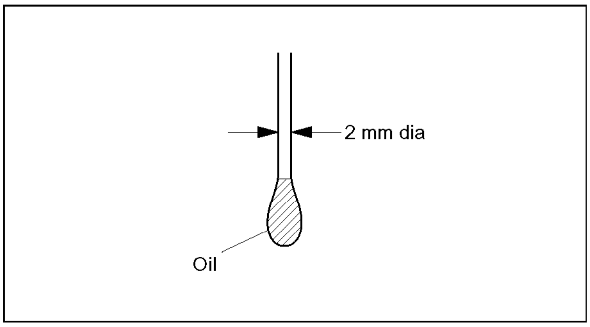


## 4. Oil and grease

Be sure to use the specified oil and grease.
If the different oil or grease is used, serious problem may result due to the differences in viscosity and ingredients.
Serious problems may also occur when dust mixes the oil and grease.
Be sure to use the following oil and grease.

| | |
|---|---|
| Oil : | 7-661-018-18 |
| Grease (SGL-801) : | 7-651-000-11 |

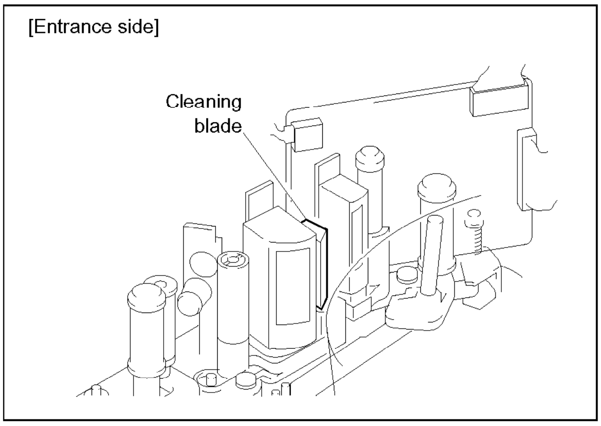
- A drop of oil means the amount adhered to the end of a stick (2 mm in diameter) as shown in the figure.
- Apply a thin film of grease on the surface.
  Be sure to wipe off grease which has adhered to the other areas using a gauze or soft cloth.
- Do not use oil and grease on the other areas.



## 3-10-2. Notes for Parts Replacement

### 1. Cleaning blade

Never touch the tape cleaner that is attached to the entrance head assembly with bare fingers as the sharp edges of the cleaning blade may cut your fingers. When replacing or adjusting the parts around the tape cleaner, be careful not to cut your fingers.



### 2. Tools

- Before using tools, be sure to clean the surfaces.
- Cleaning cloth : 3-184-527-01
- Cleaning fluid : 9-919-573-01

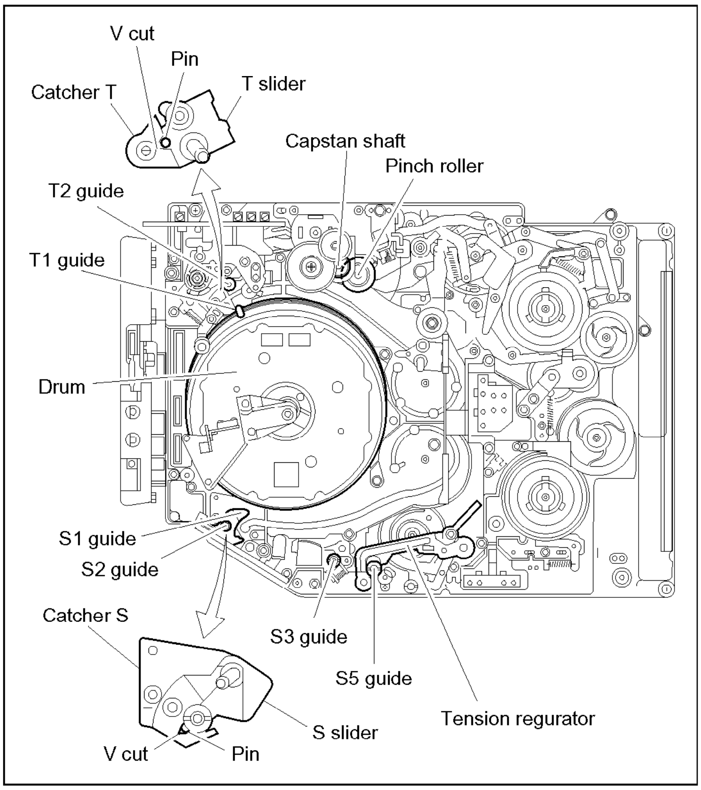
- Be sure not to scratch tools during use.
  Adjustments cannot be carried out correctly with the tools scratched.

## 3-10-3. Threading End/Unthreading End Mode

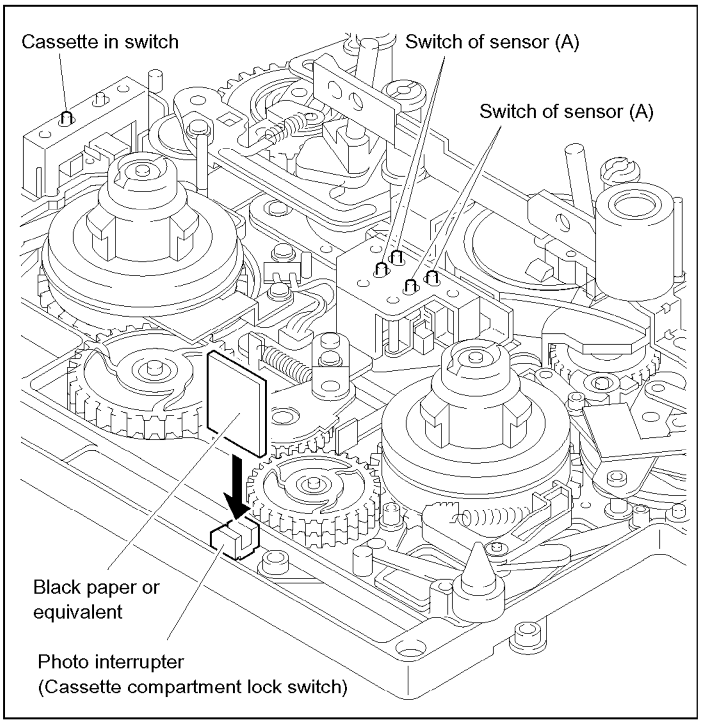
### 1. Threading end mode

Threading end mode means that the S and T sliders move from around the reel tables to both sides of the drum, and stop at the V cut portions of catchers S and T.

(1) Setting the threading end mode using a tape
- Insert a cassette tape in the cassette compartment.
- Close the front lid.


V cut
Pin
Catcher T
T slider
Capstan shaft
Pinch roller
T2 guide
T1 guide
Drum
S1 guide
S2 guide
Catcher S
S3 guide
S5 guide
Tension regurator
S slider
V cut
Pin

(2) Setting the threading end mode without using a tape
- Place the cassette compartment into the down state.
  (If the cassette compartment is not attached to the unit, cover the cassette compartment lock switch (photo interrupter) on the SE board using a black paper, ete.)
- In this state, press the cassette-in switch for about 1 second while pressing the four switches of sensor (A).


Cassette in switch
Switch of sensor (A)
Switch of sensor (A)
Black paper or equivalent
Photo interrupter
(Cassette compartment lock switch)

### 2. Unthreading end mode

Unthreading end mode means that the S and T sliders move from the catchers S and T in the directions of the reel tables, and stop.

The unthreading end mode is the same as the STBY mode. If the unit is set into this mode, the cassette compartment will rise up.

(1) Setting the unthreading end mode
- Press the EJECT button.

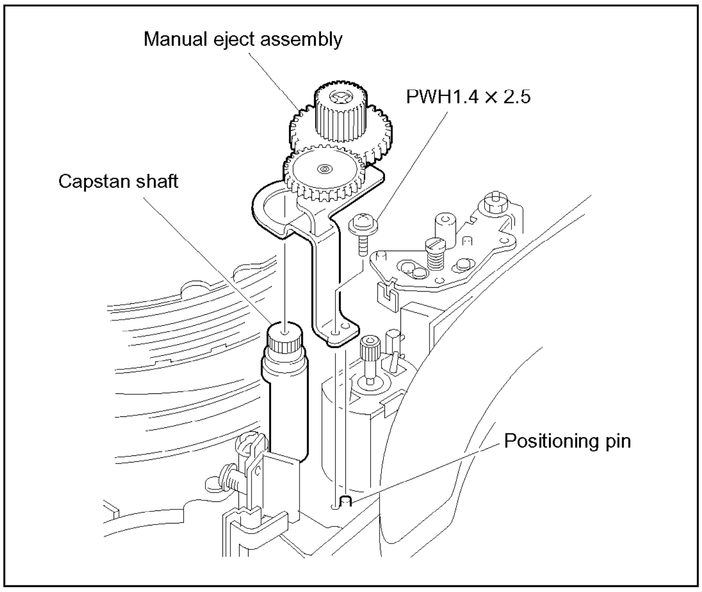
## 3-10-4. Manual Eject Assembly Removal/Installation

### Removal

(1) Turn the power off.
(2) Remove the front lid and outside panel. (Refer to Section 2-4 of the maintenance manual part 1.)
(3) Remove the screw and the manual eject assembly.

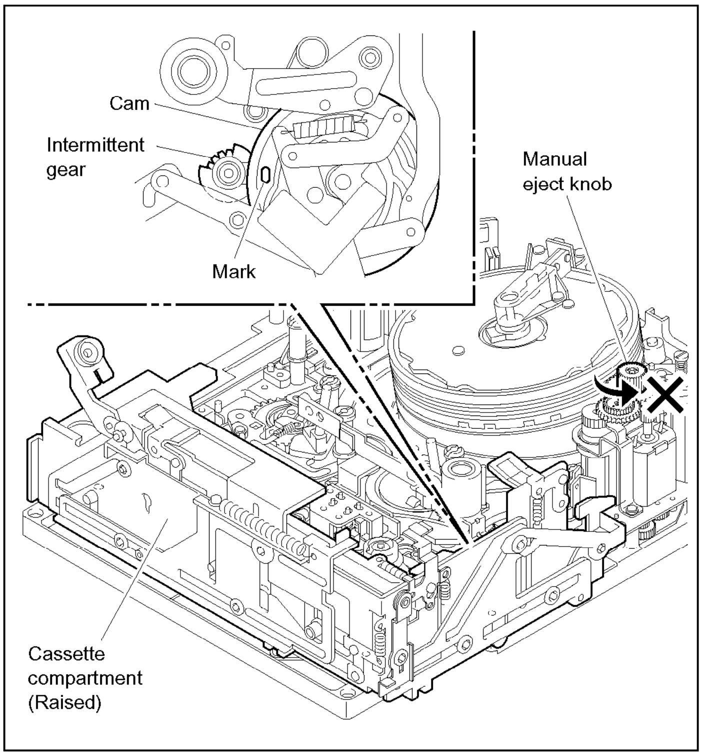
### Installation

(1) Pass the capstan shaft through the big hole of the manual eject assembly.
(2) Tighten the screw.
(3) While pressing down the knob of the manual eject assembly, turn it in the direction or reverse direction of the arrow. When turning it, check to see that the gears engage and turn correctly.


Manual eject assembly
PWH1.4 × 2.5
Capstan shaft
Positioning pin

**Notes**

- After the cassette compartment rises up, do not continue turning the manual eject knob counterclockwise.
  If turned continuously, the component parts of the unit will break.
  When the marking on the cam is at the position shown in the figure, never turn the manual eject knob counterclockwise.
- When closing the front lid after using the manual eject knob, be sure to turn the power on.


Cam
Intermittent gear
Mark
Manual eject knob
Cassette compartment (Raised)

## 3-10-5. Upper Drum Assembly Replacement

---

### Overview

#### Replacement

Brush cover removal
Brush assembly removal
Desoldering the leads of slip ring assembly
Upper drum assembly removal
Cleaning of contact surfaces
Upper drum assembly installation
Upper drum eccentricity adjustment tool installation
Upper drum eccentricity adjustment
Upper drum eccentricity adjustment tool removal
Soldering the leads of slip ring assembly
Brush assembly installation
Brush cover installation
Cleaning of video heads and tape running surfaces

#### Adjustments/checks after replacement

Tape running check
Video tracking check
CTL head height check
CTL head position check
CUE head height check
CUE/TC head position check
Servo system adjustment
Equalizer adjustment

---

### Notes

If rotary heads become worn out or broken, replace the whole upper drum assembly. The head chip cannot be replaced.

---

### Basic information

Apart from periodic replacement, the upper drum assembly needs to be replaced in the following case.

- Correct RF waveform is not obtained after the tracking adjustment.

---

### Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

**Reference**

The upper drum assembly can be replaced with the cassette compartment attached to the unit.

## Tools

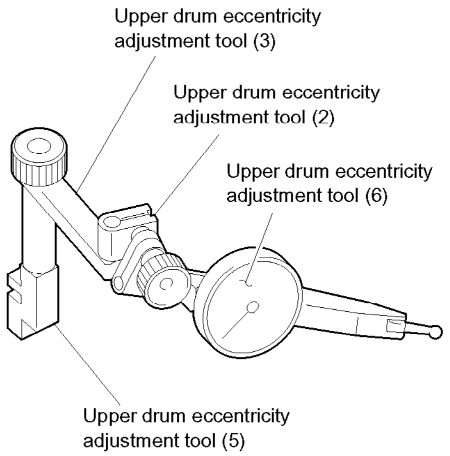
- Torque screwdriver bit (for M2) : J-6325-380-A
- Hexagon bit (across 1.5 mm) : J-6326-120-A
- Torque screwdriver (for 3 kg) : J-6325-400-A
- Upper drum eccentricity adjustment tool (3) : J-6001-820-A
- Upper drum eccentricity adjustment tool (2) : J-6001-830-A
- Upper drum eccentricity adjustment tool (5) : J-6087-000-A
- Upper drum eccentricity adjustment tool (6) : J-6325-530-A
- L wrench (across 1.5 mm) : 7-700-736-05
- Cleaning cloth : 3-184-527-01
- Cleaning fluid : 9-919-573-01

**References**

(1) If the upper drum assembly is attached to the flange, tighten the screws using a 2-level torque.
- First : $9.8 \times 10^{-2}$ N•m {1.0 kfg•cm}
- Second : $24.5 \times 10^{-2}$ N•m {2.5 kgf•cm}

To tighten the screws to the above torque reading, set the torque to $9.8 \times 10^{-2}$ N•m {1.0 kgf•cm} after attaching the hexagon bit to the torque screwdriver.

(2) Assemble the upper drum eccentricity adjustment tool as shown in the figure.

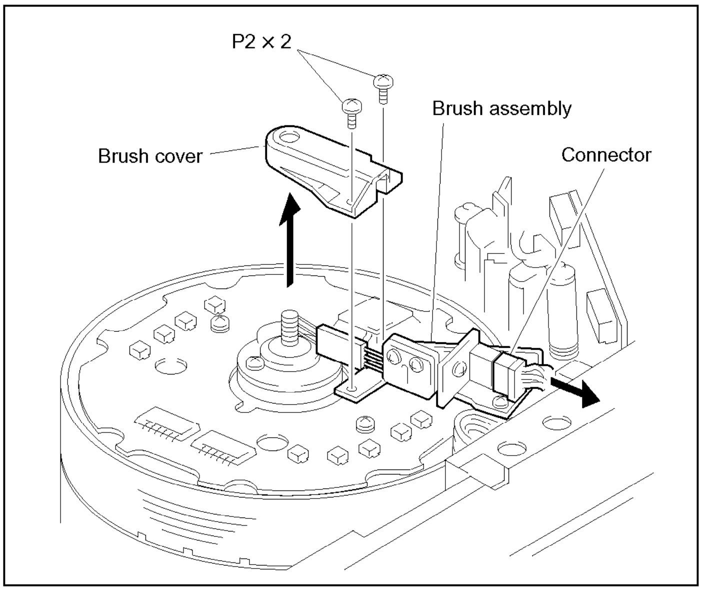

Upper drum eccentricity adjustment tool (3)
Upper drum eccentricity adjustment tool (2)
Upper drum eccentricity adjustment tool (6)
Upper drum eccentricity adjustment tool (5)

## Removal

### 1. Brush cover removal

(1) Disconnect the connector connected to the brush assembly board.

(2) Remove the two screws and brush cover.


P2 × 2
Brush assembly
Brush cover
Connector

### 2. Brush assembly removal

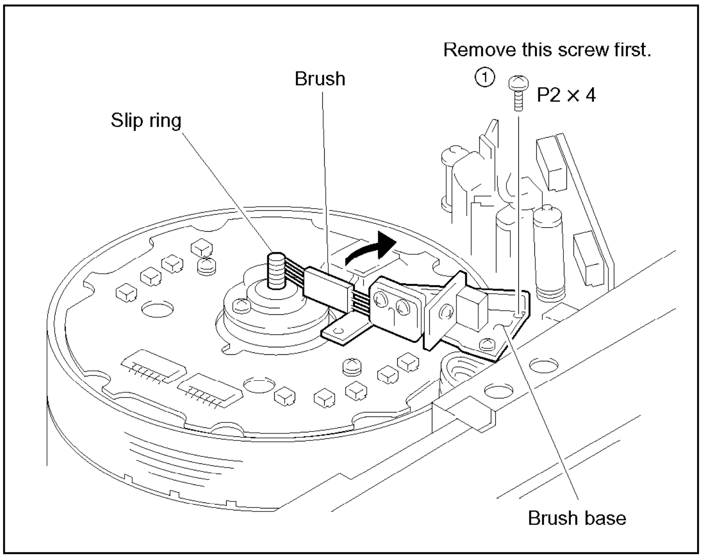
(1) Remove the ① marked screw of the two screws securing the brush base.

(2) Loosen the other screw and move the brush base in the direction of the arrow. This will release the brush and slip ring.

(3) Remove the screw loosened in step (2) and remove the brush assembly.

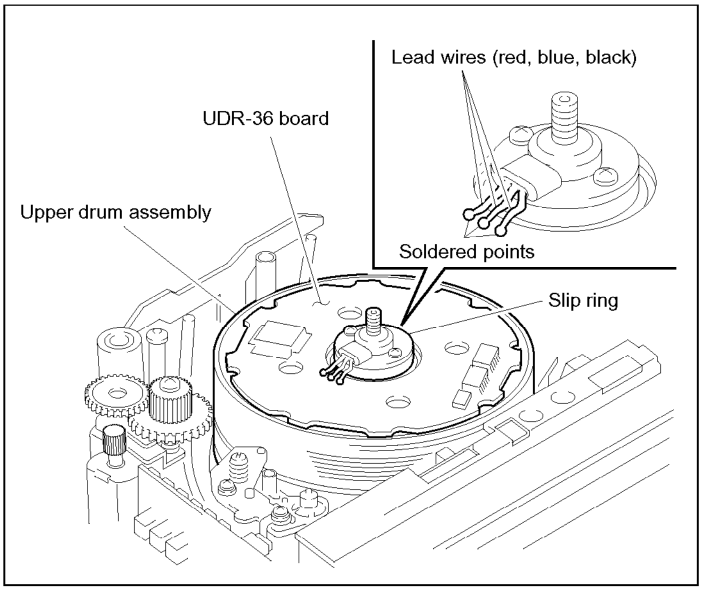
**Note**

Never touch the brush.


Remove this screw first.
Brush
①
P2 × 4
Slip ring
Brush base

### 3. Desoldering of the leads of slip ring assembly

Disconnect the three leads of the slip ring assembly from the UDR-36 board on the upper drum assembly.


Lead wires (red, blue, black)
UDR-36 board
Upper drum assembly
Soldered points
Slip ring

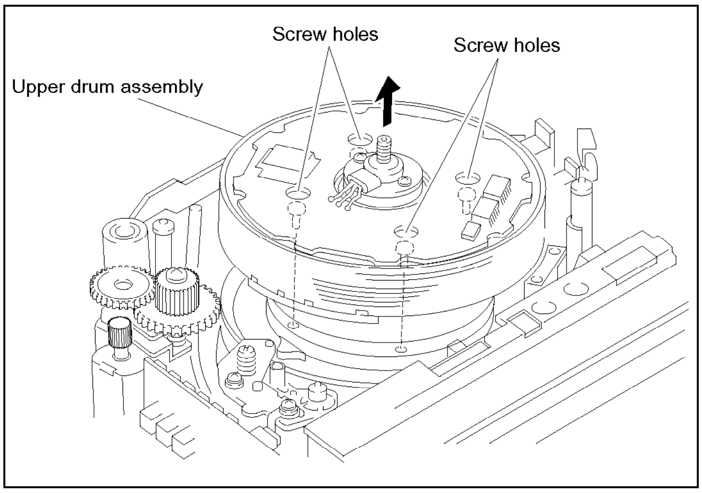
### 4. Upper drum assembly removal

(1) Insert the L wrench in the holes of the upper drum assembly and remove the four screws.

(2) Lift the upper drum assembly straight up and remove it.

**Notes**

- After removing, be sure not to damage the upper edge of the lower drum.
- Remove the screws from the removed upper drum assembly using a pair of tweezers.


Screw holes
Screw holes
Upper drum assembly

## Installation

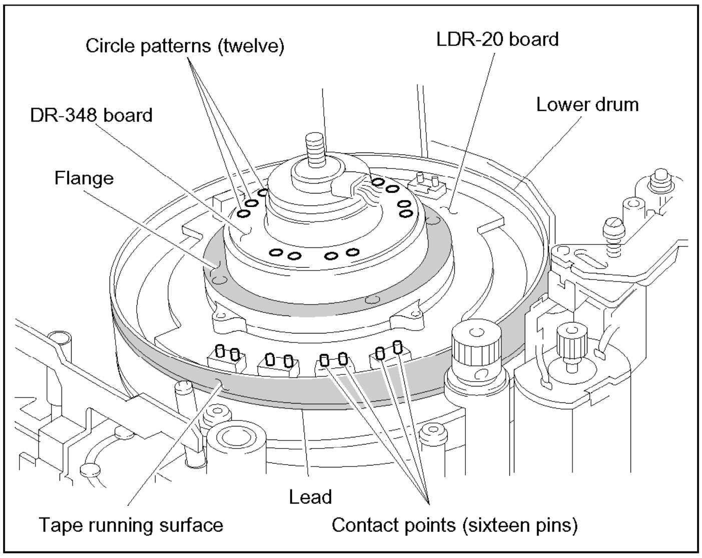
### 5. Cleaning of contact surfaces

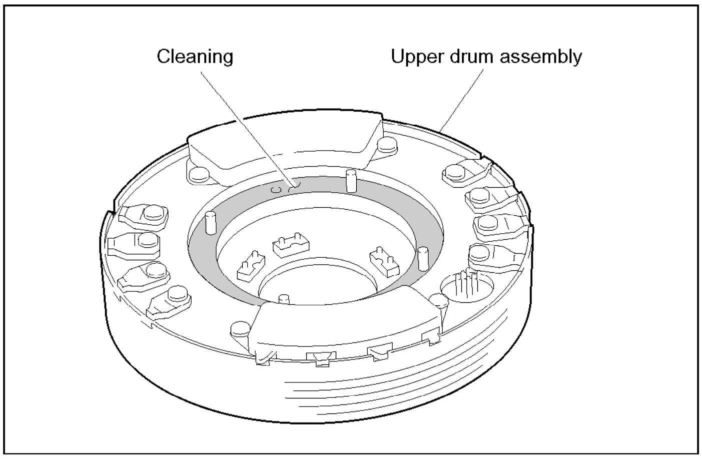
(1) Clean the following places using a cleaning cloth moistened with cleaning fluid. (Shaded portion)
- Flange of the lower drum
- Tape running surface and lead of the lower drum
- Contact surface of the new upper drum assembly

(2) Wipe the eight contact points (sixteen pins) mounted onto the LDR-20 board of the flange and twelve circle patterns on the DR-348 board using a dry cleaning cloth.

**Note**

Never clean using a cleaning cloth moistened with cleaning fluid.


Circle patterns (twelve)
LDR-20 board
Lower drum
DR-348 board
Flange
Lead
Tape running surface
Contact points (sixteen pins)


Cleaning
Upper drum assembly

## 6. Upper drum assembly installation

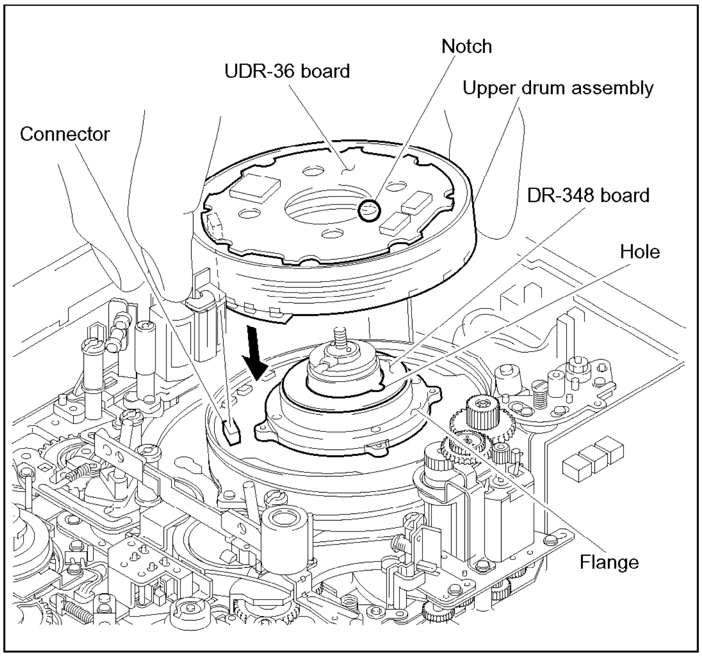
(1) Hold parts other than the video head of the new upper drum assembly by hand. Align the notch of the center hole on the UDR-36 board to the hole of the DR-348 board.

(2) Move the upper drum assembly in the direction of the flange (Do not tilt.) and connect a 6-pin connector plug to the connector on the LDR-8 board of flange.

**Note**

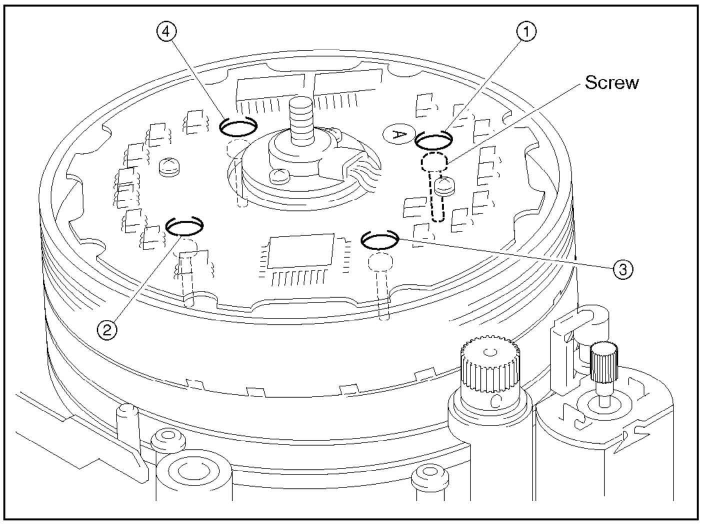
When attaching the upper drum assembly, be careful not to touch the video heads against the brush support or the peripheral parts.

(3) Press the upper drum assembly in the direction of the flange until it is securely attached.



(4) Insert the four screws removed in step 4 in the four holes on the board of the upper drum assembly using a pair of tweezers.

(5) Using the L wrench, temporarily tighten the four screws evenly in the sequence shown in the figure. Do not tighten them.

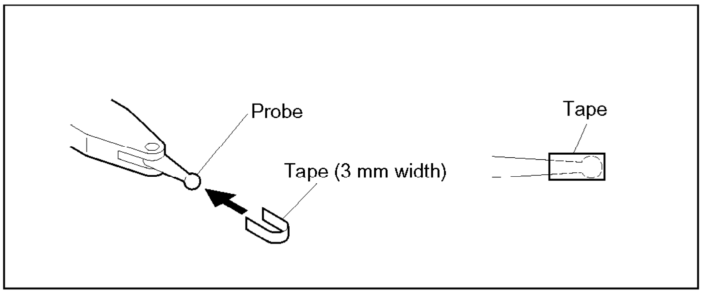


## 7. Upper drum eccentricity adjustment tool installation

(1) Clean the probe of the tool using a cleaning cloth moistened with cleaning fluid.

**Notes**

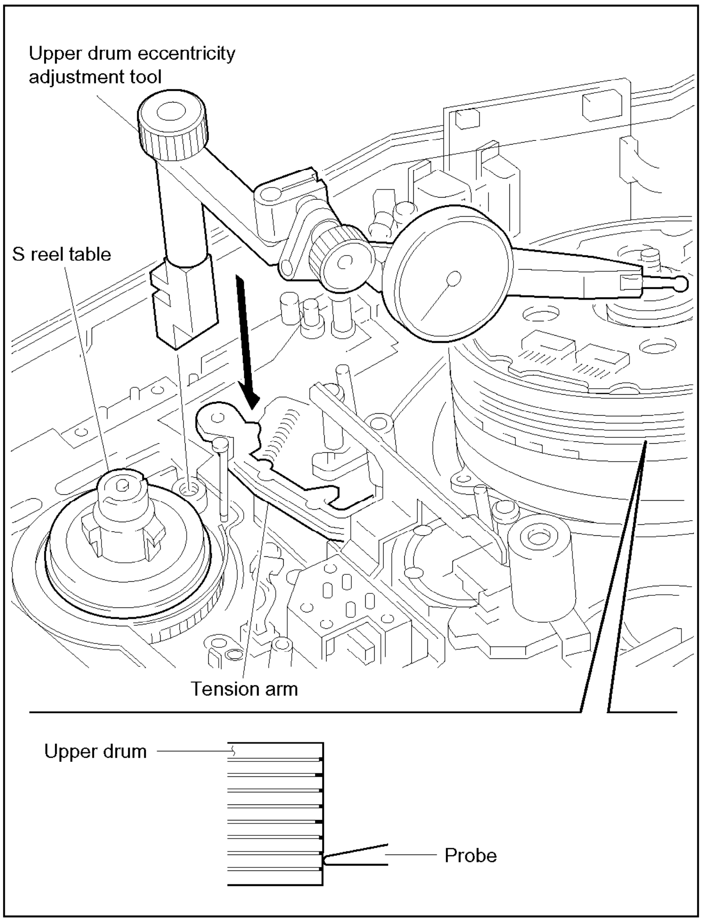
- If the probe is dirty, the upper drum assembly may be scratched.
- If a metal probe is used, it is recommended that the probe be covered with a lubricated protective tape to prevent scratching.


Probe
Tape
Tape (3 mm width)

(2) Attach the tool as shown in the figure and adjust so that the probe is positioned between the bottom two of the eight grooves located on the outside of the upper drum assembly.

**Note**

Be sure not to touch the probes against the video heads


Upper drum eccentricity adjustment tool
S reel table
Tension arm
Upper drum
Probe

## 8. Upper drum eccentricity adjustment

(1) Slowly turn the upper drum assembly counterclockwise and within one turn, check to see that the indicated deflection of the gauge satisfies the following specification.

Specification: Within 3 μm

If the specification is not satisfied, repeat the following three steps until it is.

(a) Slowly turn the upper drum assembly counterclockwise and check the maximum and minimum deflections.

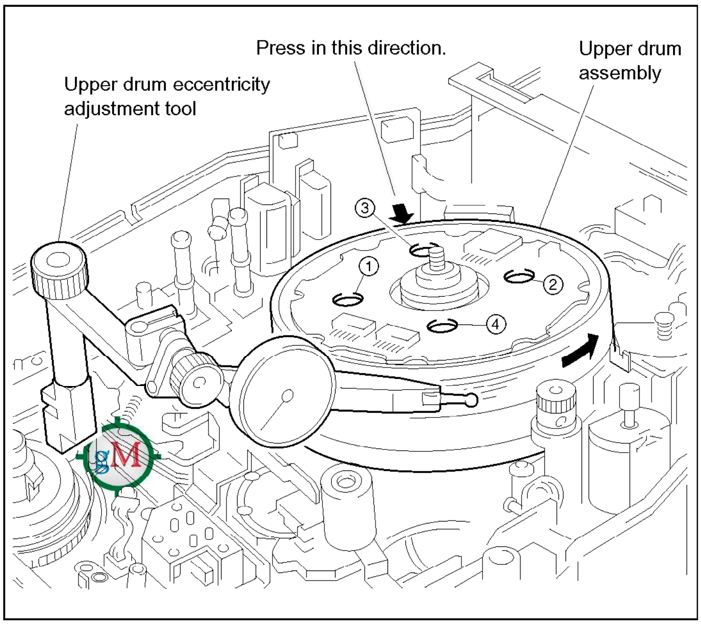
(b) Turn the upper drum assembly until the minimum deflection.

(c) From the end opposite the probe press the upper drum assembly in the direction of the arrow so that the indicated deflection is half way between the maximum and minimum values.

**References**

If the indicated deflection does not change when the upper drum assembly is pressed by the finger, loosen the four screws securing the upper drum assembly.

If the indicated deflection changes easily when pressed, tighten the screws slightly.



(2) Set the torque screwdriver to 9.8 × $10^{-2}$ N•m {1.0 kgf•cm}. Insert the torque screwdriver in the four holes on the board of the upper drum assembly. Tighten the four screws in the sequence shown in the figure.

**Note**

When tightening the screws just after the eccentricity adjustment, be sure to tighten them to 9.8 × $10^{-2}$ N•m {1.0 kgf•cm}.

(3) Set the torque screwdriver to 24.5 × $10^{-2}$ N•m {2.5 kgf•cm}.

(4) Tighten the four screws in the same sequence as in step (2).

(5) Re-check that the specification is met.

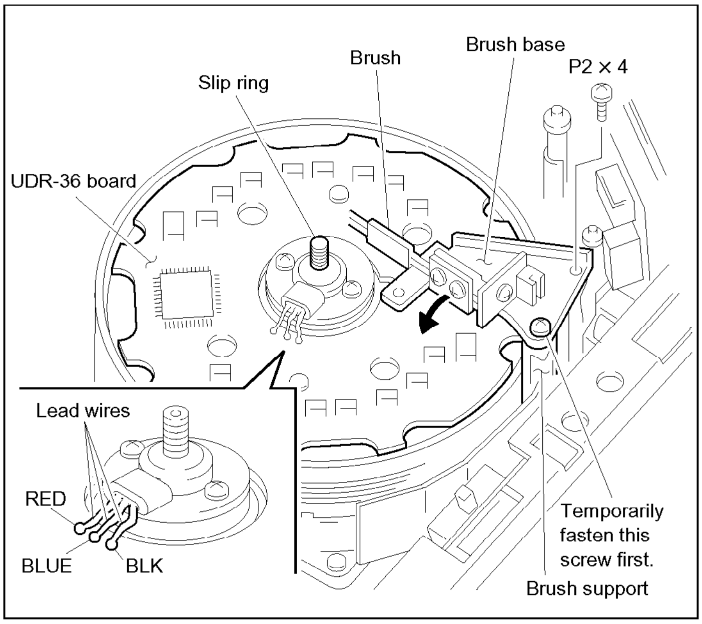
## 9. Upper drum eccentricity adjustment tool removal

Remove the upper drum eccentricity adjustment tool.

### 10. Soldering of the leads of slip ring assembly

Solder the three leads of the slip ring assembly to the UDR-36 board on the upper drum assembly.

| | |
|---|---|
| Red lead : | RED pattern |
| Blue lead : | BLUE pattern |
| Black lead : | BLK pattern |



### 11. Brush assembly installation

(1) Temporarily attach the brush assembly to the brush support using the screw as shown in the figure.

(2) Move the brush base while pressing down the brush base above the brush support and temporarily attach the brush assembly using the other screw.

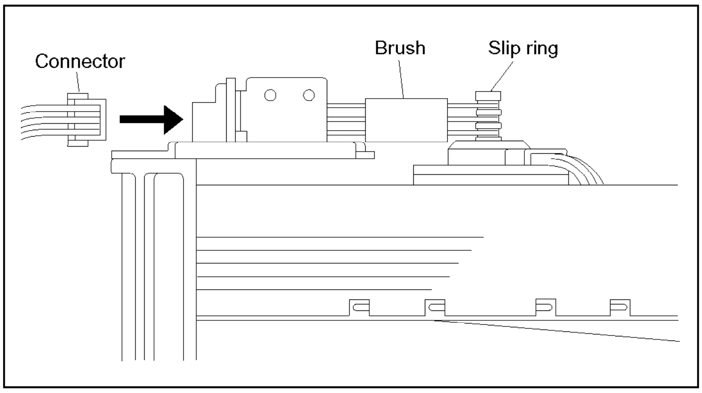
(3) Tighten the screws in steps (1) and (2).
Tightening torque : $14.7 \times 10^{-2}$ N•m {1.5 kgf•cm}

(4) Check to see that the brush touches against the slip ring.

**Reference**

Once steps (1) to (3) have been completed, the height of the brush and contact pressure against the slip ring will automatically be adjusted.

(5) Connect the connector on the brush assembly board.



### 12. Brush cover installation

Align the hole of the brush cover with the shaft of the slip ring and tighten the two screws.
Tightening torque : $9.8 \times 10^{-2}$ N•m {1.0 kgf•cm}

### 13. Cleaning of video heads and tape running surfaces

Clean the following areas using a cleaning cloth moistened with cleaning fluid.

- Video heads (Refer to Section 6-1-2 of the maintenance manual part 1.)
- Tape running surface of the upper drum (Refer to Section 6-1-2 of the maintenance manual part 1.)
- Tape running surface and lead of the lower drum (Refer to Section 6-1-3 of the maintenance manual part 1.)

**Note**

After cleaning, be sure to wipe the relevant areas using a dry cleaning cloth.

## Adjustments/checks after replacement

### 14. Tape running check

(Refer to Section 4-2-2.)

### 15. Video tracking check

(Refer to Section 4-2-3.)

### 16. CTL head height check

(Refer to Section 4-2-4.)

### 17. CTL head position check

(Refer to Section 4-2-5.)

### 18. CTL head height check

(Refer to Section 4-2-6.)

### 19. CUE/TC head position check

(Refer to Section 4-2-9.)

### 20. Servo system adjustment

(Refer to Section 6-5.)

### 21. Equalizer adjustment

(Refer to Section 6-7-8.)

## 3-10-6. Brush Assembly Replacement for Slip Ring

### Overviews

**Replacement**

Brush cover removal
Brush assembly removal
Brush assembly installation
Brush cover installation

### Notes

- If the brush is worn out, replace the whole brush assembly.
  Once the brush assembly has been attached according to the following procedures, the relative height and contact pressure against the slip ring will automatically be adjusted.
- Never clean the surface of the brush using a cleaning cloth moistened with cleaning fluid.

### Preparations

1. Turn the power off.
2. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

**Reference**

The brush assembly can be replaced with the cassette compartment attached to the unit.

### Tools

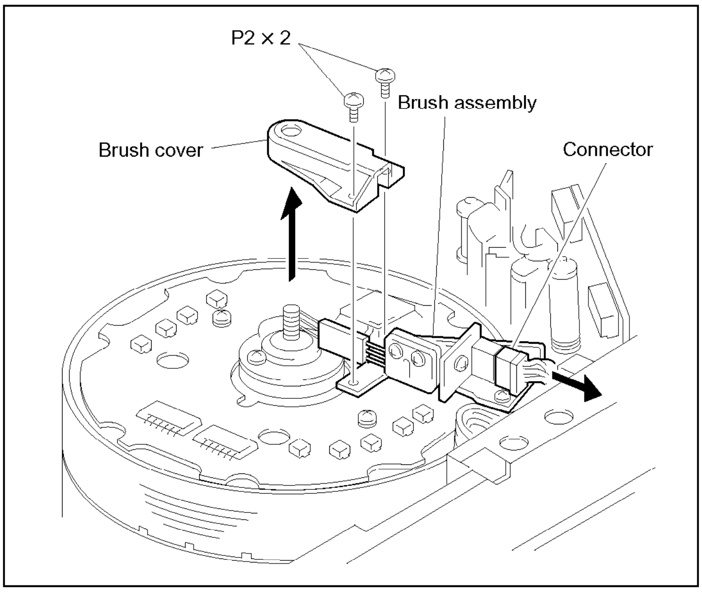
| | |
|---|---|
| • Torque screwdriver bit (for M2) : | J-6325-380-A |
| • Torque screwdriver (for 3 kg) : | J-6325-400-A |

## Removal

### 1. Brush cover removal

(1) Disconnect the connector on the brush assembly board.

(2) Remove the two screws and the brush cover.

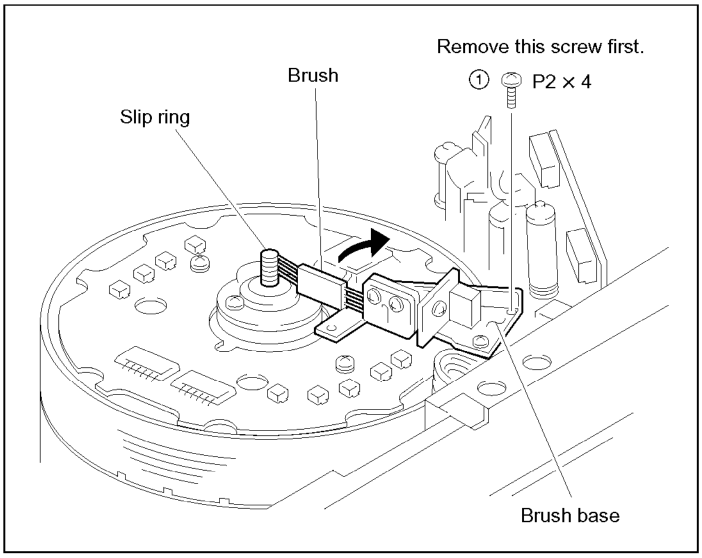

P2 × 2
Brush assembly
Brush cover
Connector

### 2. Brush assembly removal

(1) Remove the ① marked screw of the two screws securing the brush base.

(2) Loosen the other screw and move the brush base in the direction of the arrow. This will release the brush and slip ring.

(3) Remove the screw loosened in step (2) and remove the brush assembly.


Remove this screw first.
Brush
① P2 × 4
Slip ring
Brush base

## Installation

### 3. Brush assembly installation

(1) Temporarily attach the brush assembly to the brush support using the screw shown in the figure.

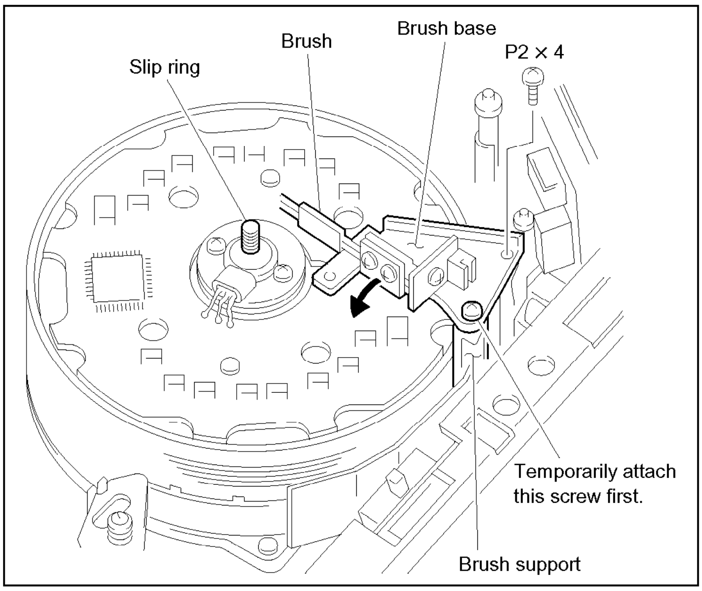
**Note**

Never touch the brush.

(2) Move the brush base while pressing down the brush base above the brush support and temporarily attach the brush assembly using the other screw.

(3) Tighten the screws in steps (1) and (2).

Tightening torque : $14.7 \times 10^{-2}$ N•m {1.5 kgf•cm}

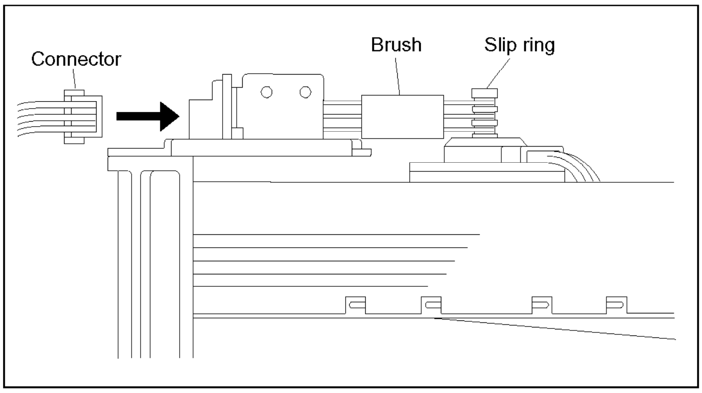

Slip ring
Brush
Brush base
P2 × 4
Temporarily attach this screw first.
Brush support

(4) Check to see that the brush touches against the slip ring.

**Reference**

Once steps (1) through (3) has been completed, the height of the brush and contact pressure against the slip ring will automatically be adjusted.

(5) Connect the connector on the brush assembly board.


Connector
Brush
Slip ring

### 4. Brush cover installation

Align the hole of the brush cover with the shaft of the slip ring and tighten the two screws.

Tightening torque : $9.8 \times 10^{-2}$ N•m {1.0 kgf•cm}

## 3-10-7. Slip Ring Assembly Replacement

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### Overviews

**Replacement**

Brush cover removal
Brush assembly removal
Slip ring assembly removal
Slip ring assembly installation
Brush assembly installation
Brush cover installation

---

### Notes

If the slip ring is worn out, replace the whole slip ring assembly.
Once the slip ring assembly has been replaced, it need not be adjusted
Never clean the surface of the slip ring assembly using a cleaning cloth moistened with cleaning fluid.

---

### Preparations

1. Turn the power off.
2. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

**Reference**

The slip ring assembly can be replaced with the cassette compartment attached to the unit.

---

### Tools

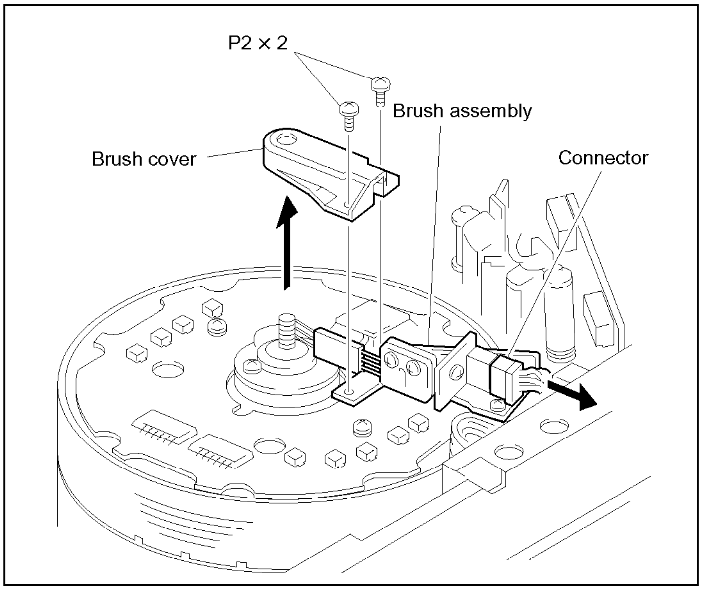
| | |
|---|---|
| • Torque screwdriver bit (for M2) : | J-6325-380-A |
| • Torque screwdriver (for 3 kg) : | J-6325-400-A |

## Removal

### 1. Brush cover removal

(1) Disconnect the connector on the brush assembly board.

(2) Remove the two screws and brush cover.


P2 × 2
Brush assembly
Brush cover
Connector

### 2. Brush assembly removal

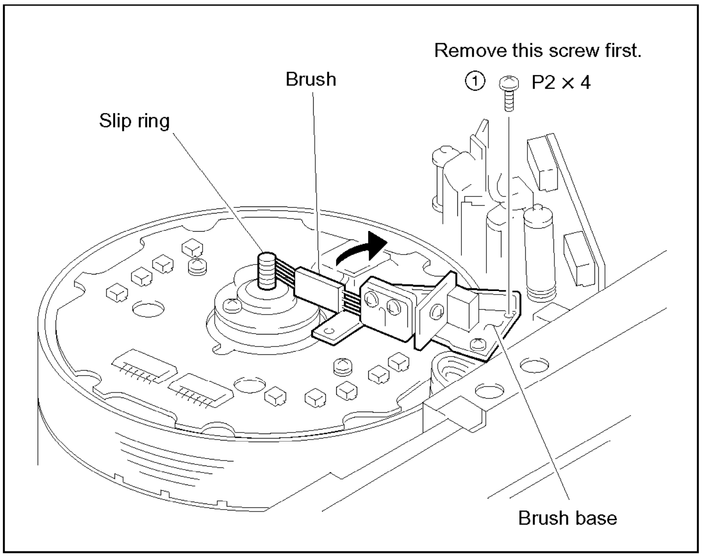
(1) Remove the ① marked screw of the two screws securing the brush base.

(2) Loosen the other screw and move the brush base in the direction of the arrow. This will release the brush and slip ring.

(3) Remove the screw loosened in step (2) and remove the brush assembly.

**Note**

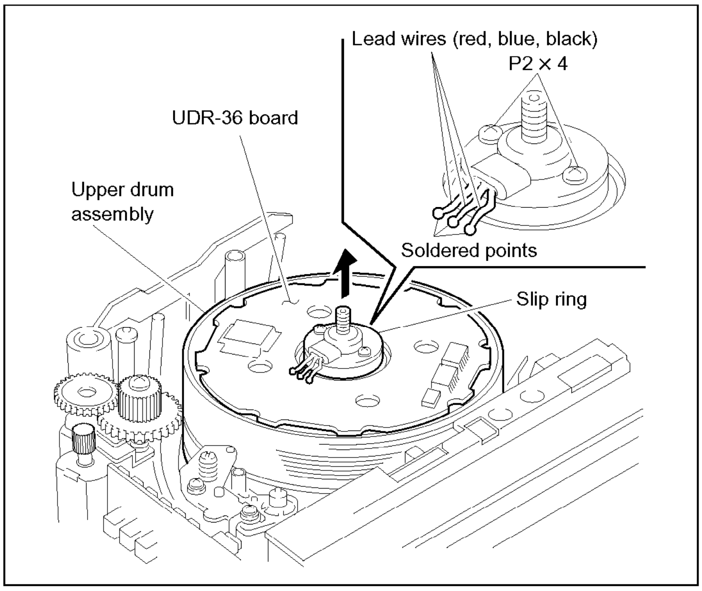
Never touch the brush.


Remove this screw first.
Brush
① P2 × 4
Slip ring
Brush base

### 3. Slip ring assembly removal

(1) Desolder the three leads of the slip ring assembly from the UDR-36 board on the upper drum assembly.

(2) Remove the two screws and slip ring assembly.


Lead wires (red, blue, black)
P2 × 4
UDR-36 board
Upper drum assembly
Soldered points
Slip ring

## Installation

### 4. Slip ring assembly installation

(1) Attach the slip ring assembly to the drum shaft so that the three leads of the slip ring assembly are positioned to the printed silk (RED, BLUE and BLK) on the UDR-36 board of the upper drum assembly.

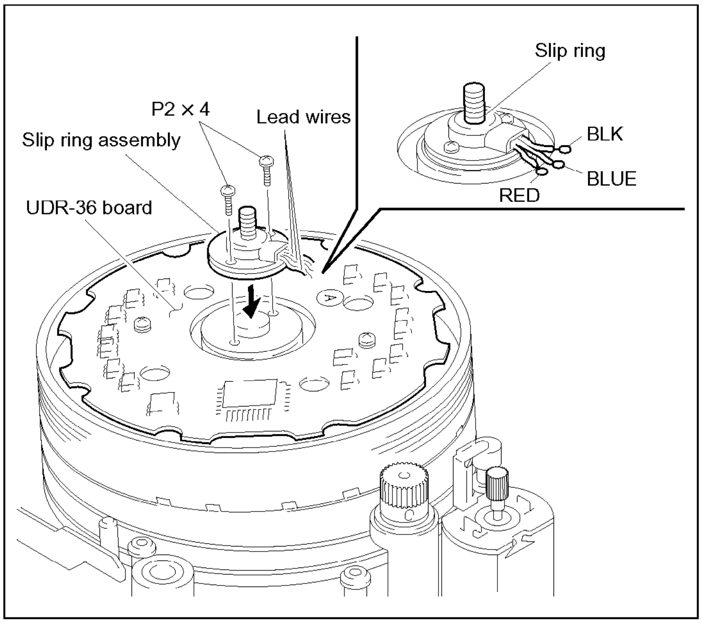
**Notes**

Hold the black portion of the slip ring assembly. Never touch the slip ring.

(2) Attach the slip ring assembly using the two screws.

(3) Solder the three leads of the slip ring assembly to the UDR-36 board on the upper drum assembly.

Red lead : RED pattern
Blue lead : BLUE pattern
Black lead : BLK pattern

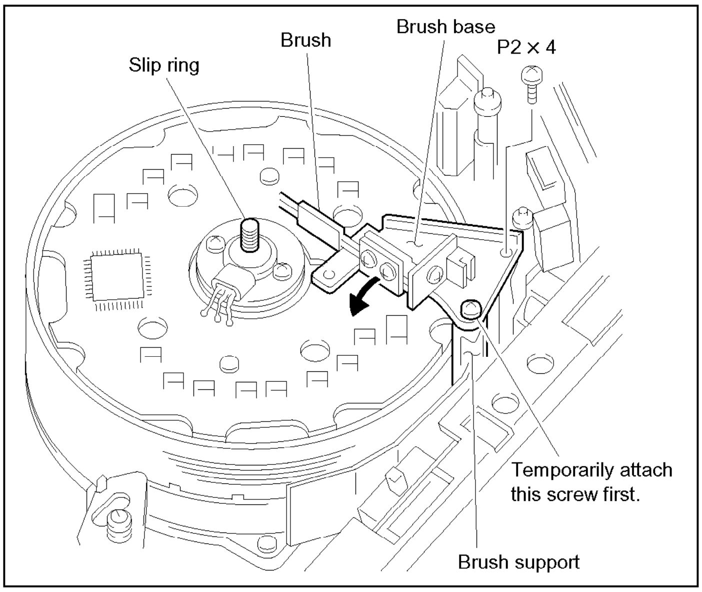

Slip ring
P2 × 4
Lead wires
Slip ring assembly
BLK
BLUE
RED
UDR-36 board

## 5. Brush assembly installation

(1) Temporarily attach the brush assembly to the brush support using the screw shown in the figure.

(2) Move the brush base in the direction of the arrow while pressing down the brush base above the brush support and temporarily attach the brush assembly using the other screw.

(3) Tighten the screws in steps (1) and (2).
Tightening torque : $14.7 \times 10^{-2}$ N•m
{1.5 kgf•cm}

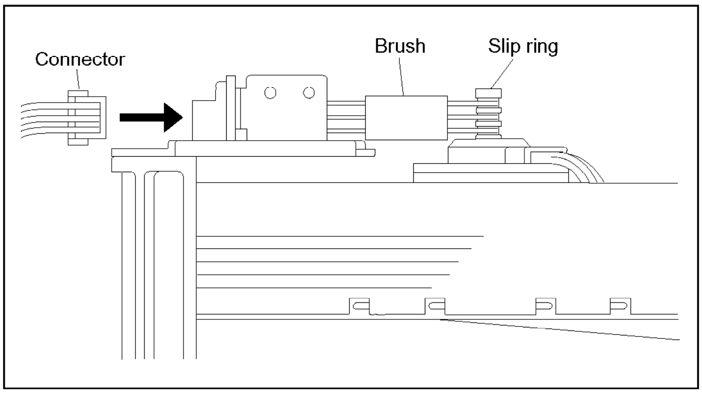

Slip ring
Brush
Brush base
P2 × 4
Temporarily attach this screw first.
Brush support

(4) Check to see that the brush touches against the slip ring.

**Reference**

Once steps (1) through (3) have been completed, the height of the brush and contact pressure against the slip ring will automatically be adjusted.

(5) Connect the connector on the brush assembly board.


Connector
Brush
Slip ring

## 6. Brush cover installation

Align the hole of the brush cover with the shaft of the slip ring and tighten the two screws.
Tightening torque : $9.8 \times 10^{-2}$ N•m {1.0 kgf•cm}

## 3-10-8. Drum Assembly Replacement

### Overviews

#### Replacement

Video head cleaner assembly removal
Drum assembly removal
Cleaning of contact surfaces
Drum assembly installation
Video head cleaner assembly installation
Cleaning of video heads and tape running surface

#### Adjustments /checks after replacement

Tape running check
Video tracking check
CTL head height check
CTL head position check
CUE head height check
CUE/TC head position check
Servo system adjustment
Equalizer adjustment

### Notes

When replacing the drum assembly, be careful not to damage the CTL head, CUE/TC head and peripheral tape guides.
Be careful not to break the video heads of the drum assembly.

### Basic information

Apart from periodic replacement, the drum assembly needs to be replaced in the following cases.

- The drum assembly cannot be used because the tape running surface of the upper or lower drum is scratched.
- The correct RF waveform cannot be obtained after the tracking adjustment due to wear of the upper or lower drum.
- The specification of the VTR such as jitter or noise is not satisfied due to expiration of bearing’s product life.

## Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

**Reference**

The drum assembly can be replaced with the cassette compartment attached to the unit.

## Tools

- Torque screwdriver bit (for M2) : J-6325-380-A
- Torque screwdriver (for 3 kg) : J-6325-400-A
- Cleaning cloth : 3-184-527-01
- Cleaning fluid : 9-919-573-01

## Removal

### 1. Video head cleaner assemby removal

(1) Verify that the unit is in the unthreading end mode.

(2) Turn the manual eject gear clockwise.
Release the HC roller of the video head cleaner from the drum.

(3) Loosen the screw while holding the VH cleaner using a pair of tweezers and remove it from the unit.
(Refer to Section 3-10-10.)

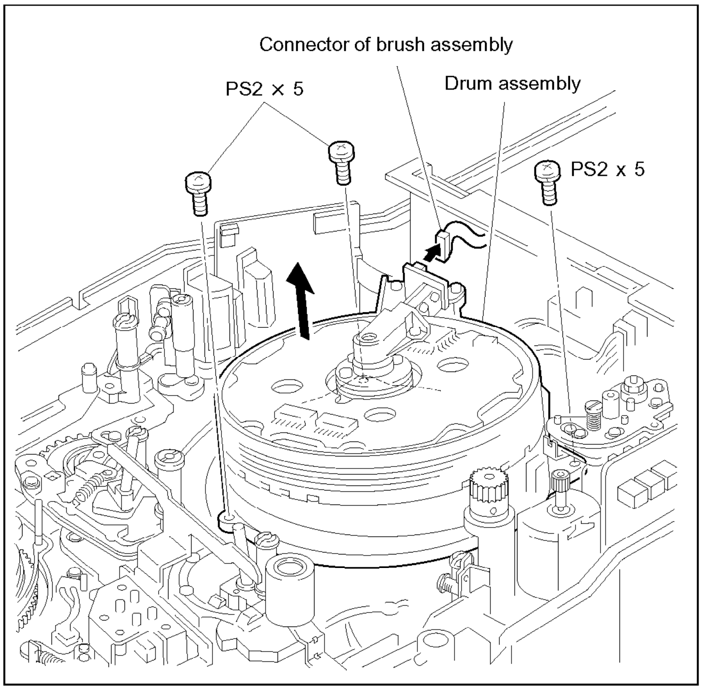
**Reference**

The screw cannot be removed due to the stopper.

## 2. Drum assembly removal

(1) Remove the three screws.

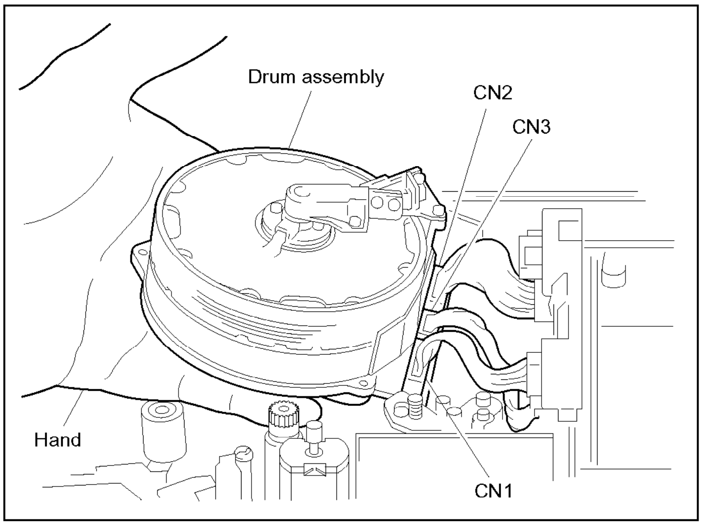
(2) Disconnect connector of the brush assembly.


Connector of brush assembly
PS2 × 5
Drum assembly
PS2 x 5

(3) Lift the drum assembly straight up and disconnect the three connectors (CN1, CN2 and CN3) on the lower board of the drum. This enables the drum assembly to be removed.

**Note**

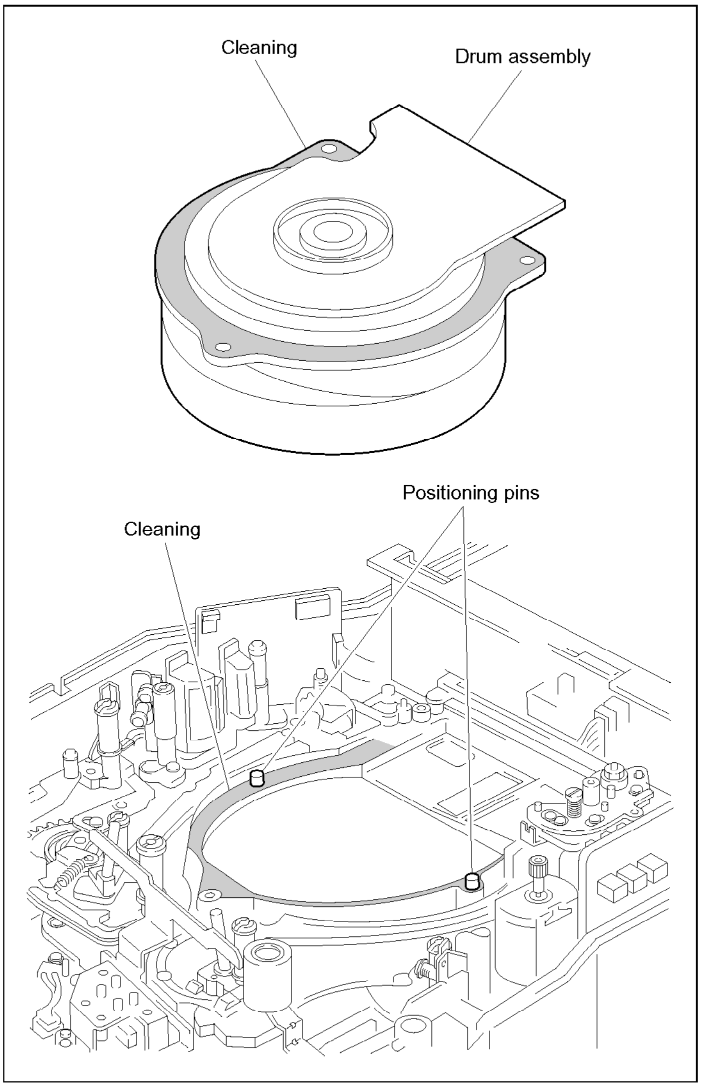
When removing the drum assembly, be careful not to damage the CTL head, CUE/TC head, and peripheral tape guides.


Drum assembly
CN2
CN3
Hand
CN1

## Installation

### 3. Cleaning of contact surfaces

Clean the contact surfaces of the new drum assembly and chassis using a cleaning cloth moistened with cleaning fluid.


Cleaning
Drum assembly
Positioning pins
Cleaning

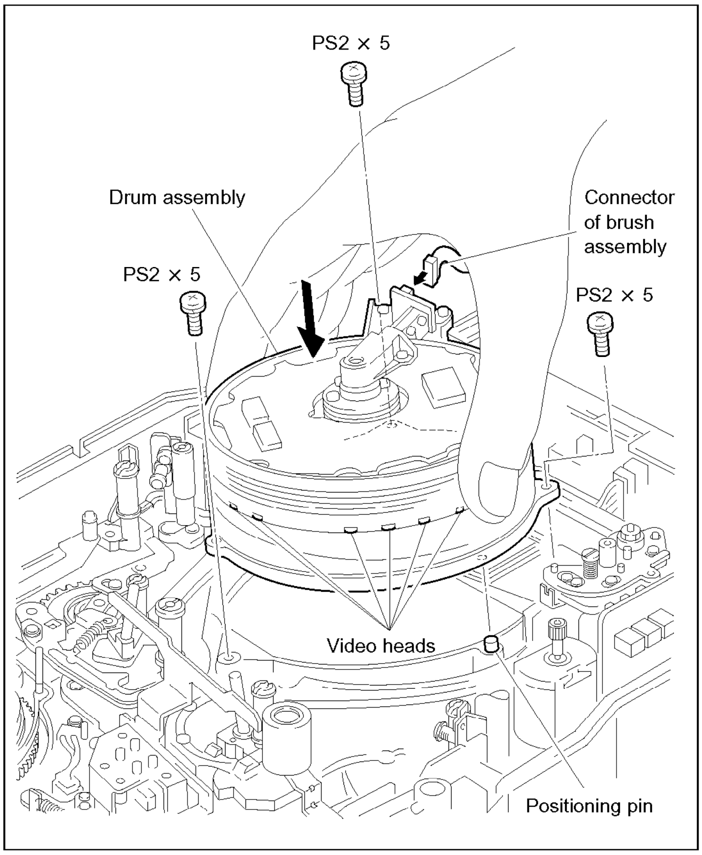
## 4. Drum assembly installation

(1) Hold the new drum assembly and connect the three connectors (CN1, CN2 and CN3) which are disconnected in step 3.

**Notes**

- When holding the new drum assembly, be sure to hold parts other than the video head.
- Be careful not to touch the drum assembly against the CTL head, CUE/TC head, and the peripheral tape guides.

(2) Insert the two positioning pins of the chassis into the holes of the drum assembly.
(3) Move the drum assembly slightly and check to see that the drum assembly goes into the positioning pins properly.
(4) Tighten the three screws, and connect the connector of the brush assembly.


PS2 × 5
Drum assembly
Connector of brush assembly
PS2 × 5
PS2 × 5
Video heads
Positioning pin

## 5. Video head cleaner assembly installation

Attach the video head cleaner to the surface of the unit using a pair of tweezers and tighten the screw.

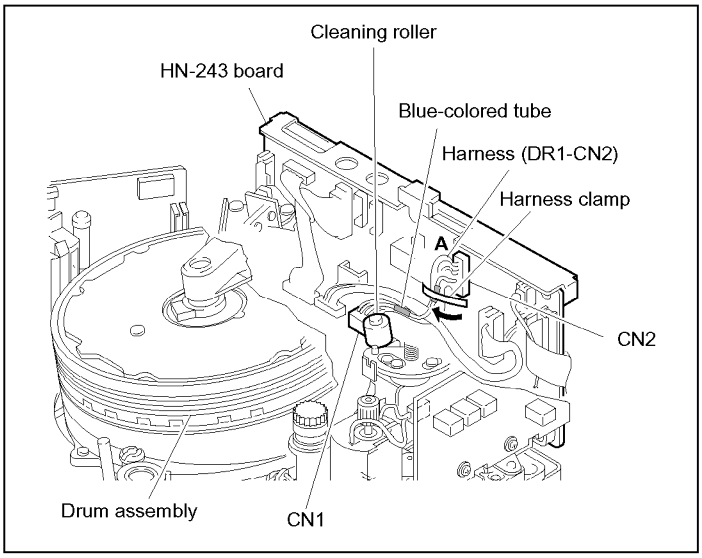
## 6. Wiring of the drum harness

- Wiring of the harness between the drum assembly and the HN-243 board should be carried out as follows.

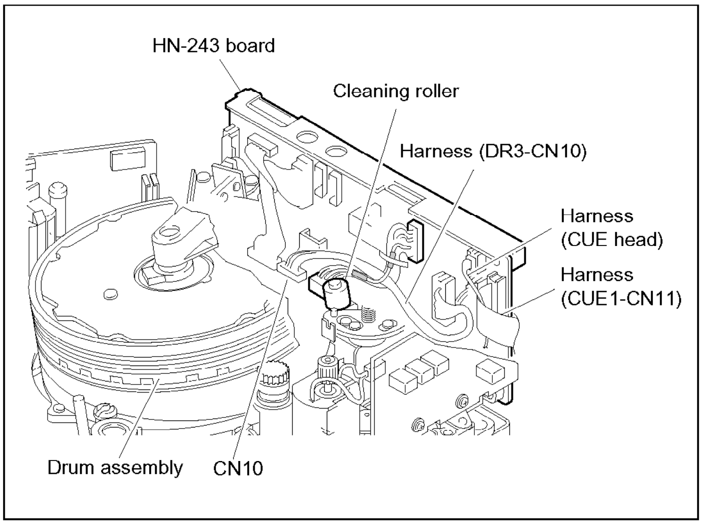
**Note**

Do not touch the harness with the cleaning roller and drum.

(1) As shown in the figure, pull a lead wire which is covered its tail end with blue-colored tube toward the drum side, and bind the remaining lead wires to position A with a harness clamp.


Cleaning roller
HN-243 board
Blue-colored tube
Harness (DR1-CN2)
Harness clamp
A
CN2
Drum assembly
CN1

(2) Arrange the harness (CUE1-CN11) and harness (CUE head) as shown in the figure.



### 7. Cleaning of video heads and tape running surface

Clean the following areas using a cleaning cloth moistened with cleaning fluid.

- Video heads (Refer to Section 6-1-2 of the maintenance manual part 1.)
- Tape running surface of the upper drum (Refer to Section 6-1-2 of the maintenance manual part 1.)
- Tape running surface and lead of the lower drum (Refer to Section 6-1-3 of the maintenance manual part 1.)

**Note**

After cleaning, be sure to wipe the relevant areas using a dry cleaning cloth.

---

## Adjustments/checks after replacement

### 8. Tape running check

(Refer to Section 4-2-2.)

### 9. Video tracking check

(Refer to Section 4-2-3.)

### 10. CTL head height check

(Refer to Section 4-2-4.)

### 11. CTL head position check

(Refer to Section 4-2-5.)

### 12. CUE head height check

(Refer to Section 4-2-6.)

### 13. CUE/TC head position check

(Refer to Section 4-2-9.)

### 14. Servo system adjustment

(Refer to Section 6-5.)

### 15. Equalizer adjustment

(Refer to Section 6-7-8.)

## 3-10-9. Pinch Roller Replacement

### Overviews

### Replacement

Pinch roller removal
Install shaft cleaning
Pinch roller installation
Pinch roller cleaning

### Checks after replacement

Tape running check
CUE head height check

### Note

If the pinch roller is worn-out, replace the pinch roller.

### Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

**Reference**

The pinch roller can be replaced with the cassette compartment attached to the unit.

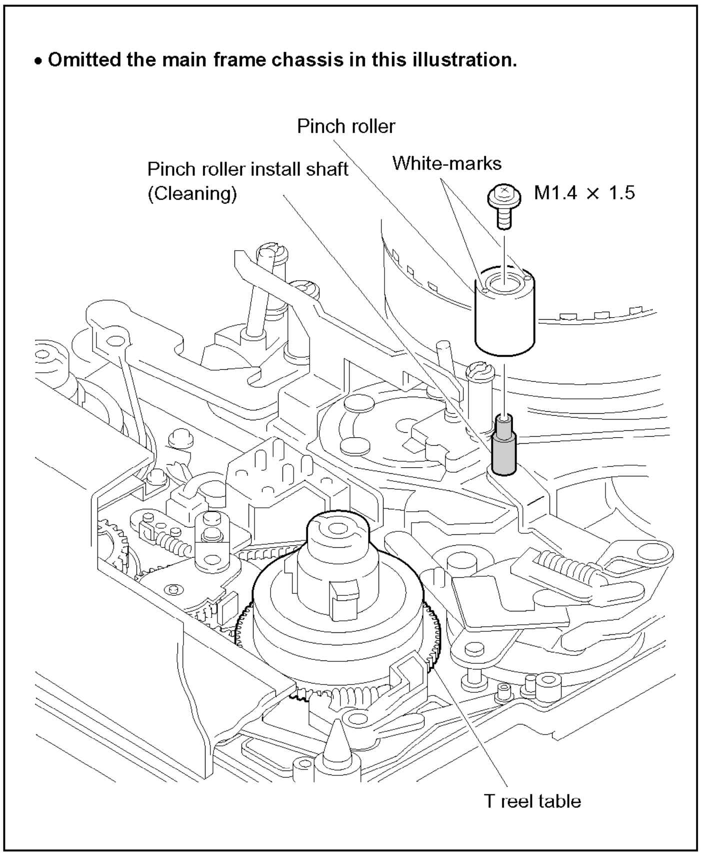
### Tools

- Torque screwdriver bit (for M1.4) : J-6325-110-A
- Torque screwdriver (for 3 kg) : J-6325-400-A
- Cleaning cloth : 3-184-527-01
- Cleaning fluid : 9-919-573-01

## Removal

### 1. Pinch roller removal

(1) Loosen the center screw of the pinch roller. Lift straight up and remove the pinch roller.
(2) Remove the screw from the pinch roller.


• Omitted the main frame chassis in this illustration.
Pinch roller
Pinch roller install shaft
(Cleaning)
White-marks
M1.4 × 1.5
T reel table

## Installation

### 2. Install shaft cleaning

Clean the pinch roller install shaft using a cleaning cloth moistened with cleaning fluid.

### 3. Pinch roller installation

Attach the pinch roller to the pinch roller install shaft with the white-marked side facing up. Tighten the screw removed in step 1.

### 4. Pinch roller cleaning

Clean the surface of the pinch roller using a cleaning cloth moistened with cleaning fluid.

## Checks after replacement

### 5. Tape running check

(Refer to Section 4-2-2.)

### 6. CUE head height check

(Refer to Section 4-2-6.)

## 3-10-10. HC Roller Assembly Replacement for Video Heads

### Overviews

**Replacement**

Mode selection
Video Head cleaner assembly removal
HC roller replacement
Video Head cleaner assembly installation
Operation check

### Notes

- No adjustments are required after replacing the HC roller assembly for the video head.
- A stop washer is used for attaching the HC roller assembly.
  When replacing the assembly, use a new CR cap (3-615-320-01).

### Preparations

1. Turn the power off.
2. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

### Tools

| | |
|---|---|
| • Torque screwdriver bit (for M1.4) : | J-6325-110-A |
| • Torque screwdriver (for 3 kg) : | J-6325-400-A |

## Removal

### 1. Mode selection

(1) Verify that the unit is the unthreading end mode.

(2) Turn the manual eject gear clockwise. Release the HC roller from the drum.

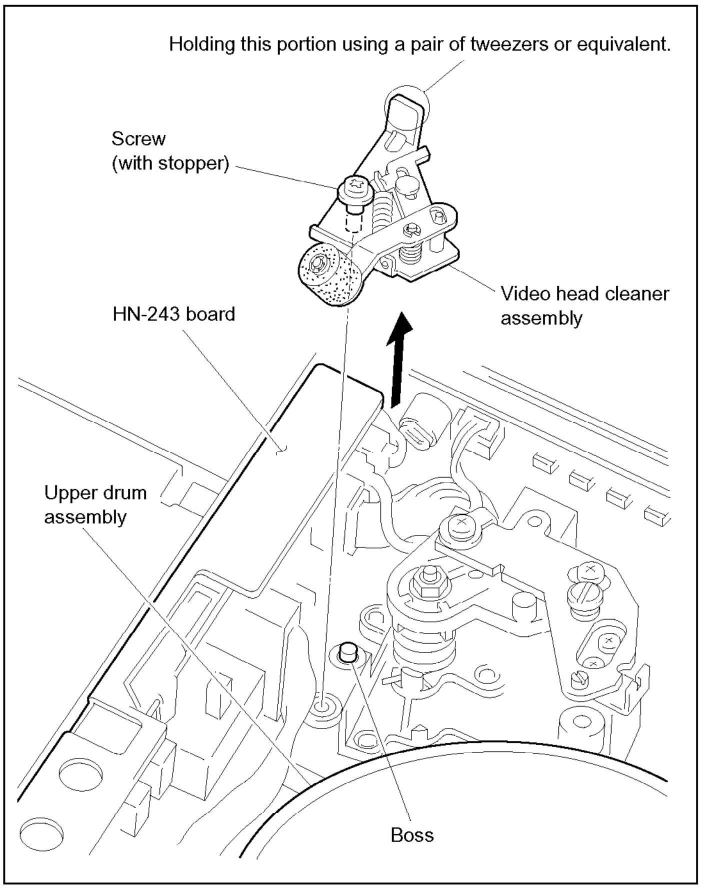
### 2. Video Head cleaner assembly removal

(1) Turn the upper drum assembly with the finger so that the video heads are not situated near the video head cleaner assembly.

(2) Loosen the screw while holding the video head cleaner using a pair of tweezers as shown in the figure and remove the video head cleaner assembly.

**Notes**

- When removing, be careful not to touch the tweezers, screwdriver, and video head cleaner assembly against the drum assembly.
- The screw cannot be removed due to the stopper.


Holding this portion using a pair of tweezers or equivalent.
Screw
(with stopper)
Video head cleaner assembly
HN-243 board
Upper drum assembly
Boss

## Installation

### 3. HC roller replacement

(1) Remove the CR cap and the HC roller assembly.

(2) Insert the new HC roller assembly in the shaft and attach using the new CR cap.

Reference

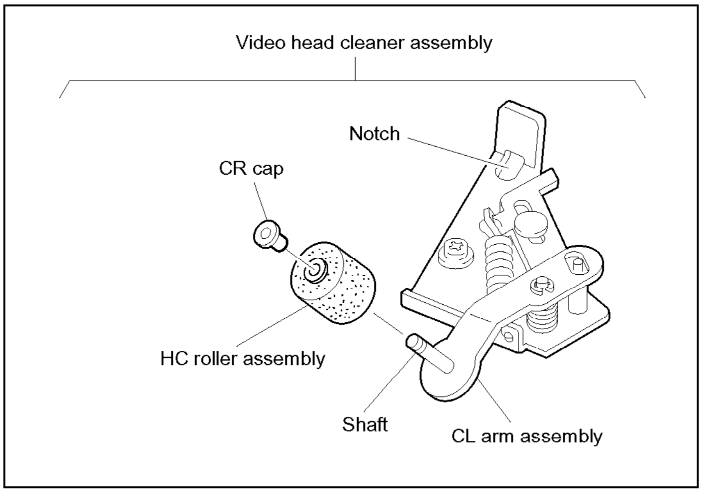
The HC roller assembly can be attached with either side facing up.

### 4. Video Head cleaner assembly installation

Insert the boss of the chassis in the notch of the video head cleaner assembly and tighten the screw.

### 5. Operation check

When turning the manual eject gear clockwise or counterclockwise, check to see that the HC roller assembly detaches from the drum and touches against the drum.


Video head cleaner assembly
Notch
CR cap
HC roller assembly
Shaft
CL arm assembly

## 3-10-11. CUE Brush Replacement for CUE Head Cleaning

### Overviews

**Replacement**

Mode selection
Manual eject assembly removal
CUE brush replacement
Manual eject assembly installation
Operation check

### Notes

- No adjustments are required after replacing the CUE brush for the CUE head cleaning.
- A stop washer is used for attaching the CUE brush.
  When replacing the assembly, use a new stop washer (3-321-393-11).

### Preparations

1. Turn the power off.
2. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

### Tool

- Stop washer fastening tool : J-6323-530-A

### Removal

#### 1. Mode selection

Verify that the unit is in the unthreading end mode.

#### 2. Manual eject assembly removal

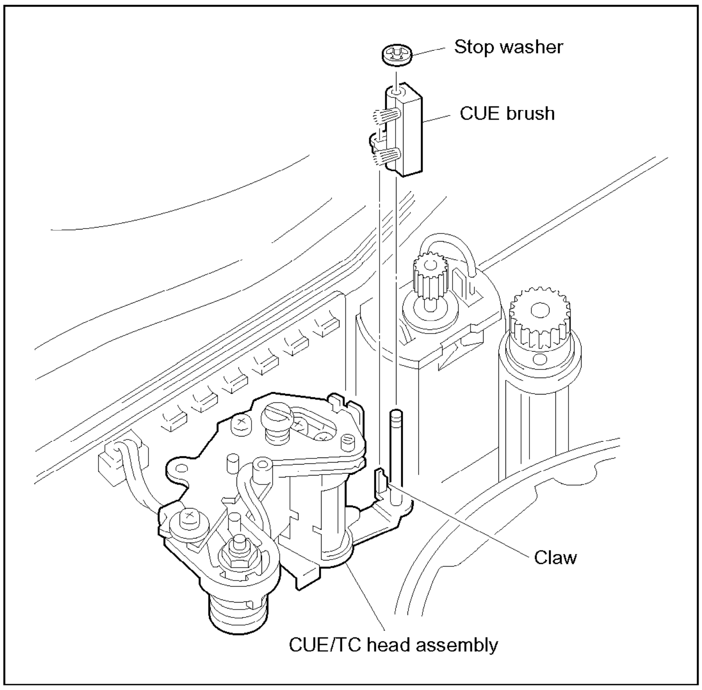
Remove the manual eject assembly.
(Refer to Section 3-10-4.)

## Installation

### 3. CUE brush replacement

(1) Remove the stop washer at the top of the CUE arm and CUE brush.

(2) Attach a new CUE brush and the stop washer.



### 4. Manual eject assembly installation

Attach the manual eject assembly.
(Refer to Section 3-10-4.)

### 5. Operation check

Check to see that when the manual eject knob is rotated in the clockwise and counterclockwise directions while pressed down, the cleaning CUE brush moves and touches the surface of the CUE head. (Refer to Section 3-10-4.)

## 3-10-12. Brake Band Assembly Replacement

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### Overviews

#### Replacement

Band holder removal
Brake band assembly removal
S reel table cleaning
Brake band assembly installation
Band holder installation

#### Checks after replacement

Check of the tension regulator operating position
FWD back tension check
Tape running check

---

### Notes

- If the felt surface of the brake band assembly has become hard or worn out, replace the brake band assembly.
- A stop washer is used for attaching the brake band assembly.
  When replacing the assembly, use a new stop washer (3-559-408-11).

---

### Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
4. Remove the cassette compartment.
   (Refer to Section 2-6 of the maintenance manual part 1.)

---

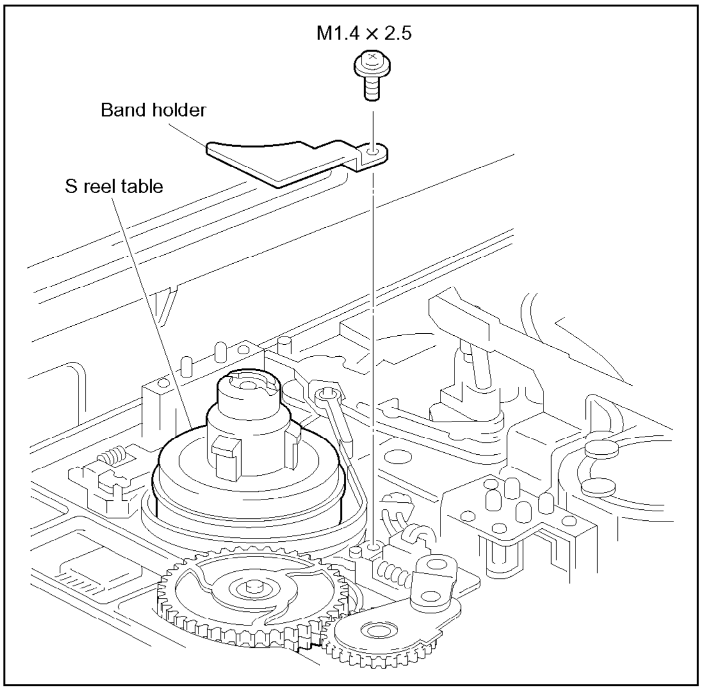
### Tools

| | |
|---|---|
| • Torque screwdriver bit (for M1.4) : | J-6325-110-A |
| • Torque screwdriver bit (for M2) : | J-6325-380-A |
| • Torque screwdriver (for 3 kg) : | J-6325-400-A |
| • Stop washer fastening tool : | J-6323-530-A |
| • Cleaning cloth : | 3-184-527-01 |
| • Cleaning fluid : | 9-919-573-01 |

## Removal

### 1. Band holder removal

Using the torque screwdriver bit (for M1.4) remove the screw and band holder.


M1.4 × 2.5
Band holder
S reel table

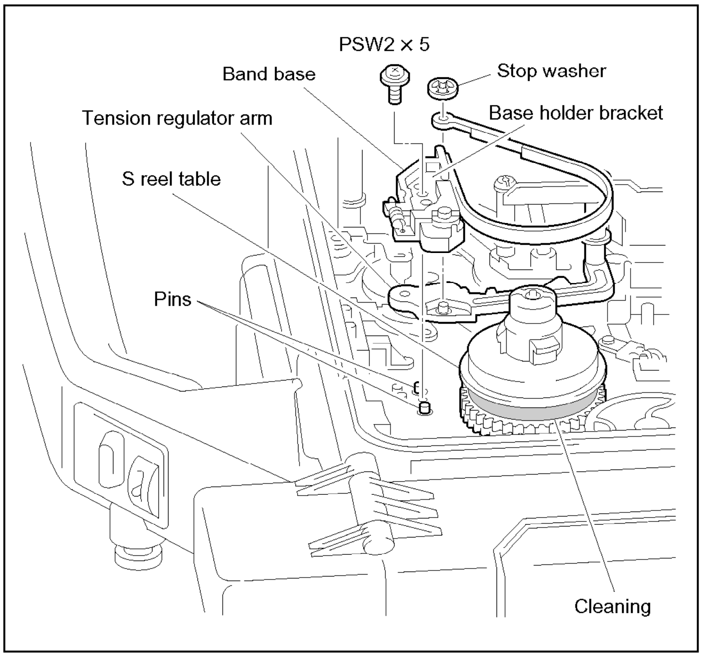
### 2. Brake band assembly removal

(1) Remove the stop washer on the tension regulator arm.

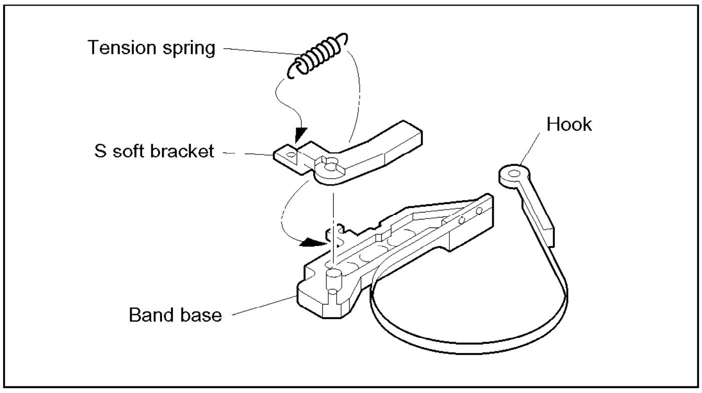
**Note**

When removing, do not apply excessive force to the tension regulator arm.

(2) Remove the screw, base holder bracket, and band base.


PSW2 × 5
Band base
Stop washer
Tension regulator arm
Base holder bracket
S reel table
Pins
Cleaning

(3) Remove the S soft bracket and the tension spring from the band base.



## Installation

### 3. S reel table cleaning

Clean the contact surface with the brake band of the S reel table using a cleaning piece moistened with cleaning fluid.

### 4. Brake band assembly installation

(1) Attach the S soft bracket and tension spring to the band base of the new brake band assembly.

(2) Insert the two pins on the chassis into the two holes of the band base of the new brake band assembly and temporarily attach it together with the base holder using the torque screwdriver bit (for M2).

(3) Insert the hook of the brake band assembly into the shaft of the tension regulator arm.

**Note**

Be careful not to scratch the brake band assembly as it may bend.

(4) Insert your finger below the tension regulator arm, and while supporting the arm, attach the stop washer.

**Note**

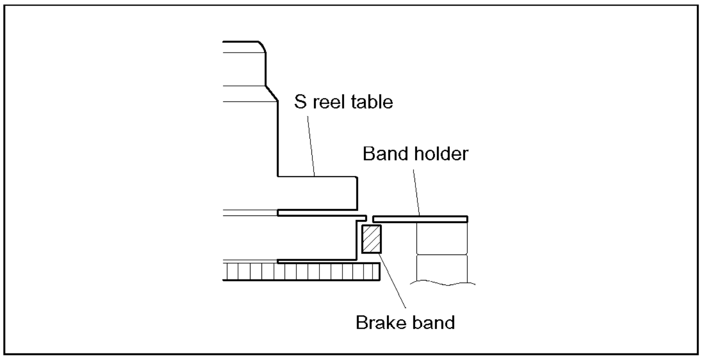
When attaching, do not apply excessive force to the tension regulator arm.

### 5. Band holder installation

(1) Attach the band holder shown in the figure.

**Notes**

- Do not sandwich the brake band between the band holder and S reel table.
- Do not touch the S reel table with the band holder.



---

## Checks after replacement

### 6. Check of the tension regulator operating position

(Refer to Section 4-1-1.)

### 7. FWD back tension check

(Refer to Section 4-1-2.)

### 8. Tape running check

(Refer to Section 4-2-2.)

## 3-10-13. T Soft Brake Assembly Replacement

### Overviews

**Replacement**

T soft brake assembly removal
T reel table cleaning
T soft brake assembly installation

**Check after replacement**

Brake torque check

### Notes

- If the tape hunches or slacks during rewinding, replace the T soft brake assembly.
- A stop washer is used for attaching the T soft brake assembly.
  When replacing the assembly, use a new stop washer (3-559-408-11).

### Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
4. Remove the cassette compartment.
   (Refer to Section 2-6 of the maintenance manual part 1.)

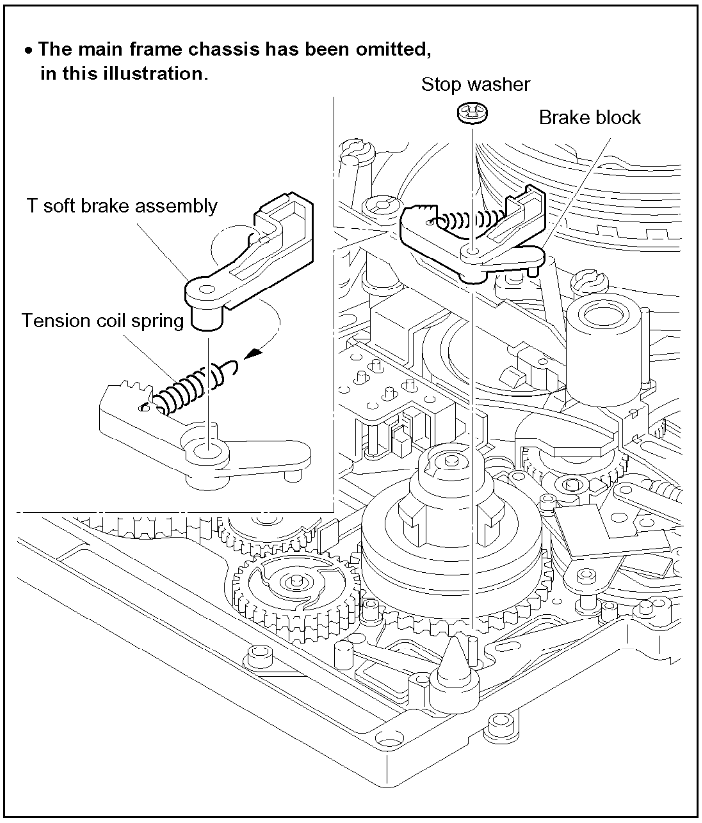
### Tools

| | |
|---|---|
| • Stop washer fastening tool : | J-6323-530-A |
| • Cleaning cloth : | 3-184-527-01 |
| • Cleaning fluid : | 9-919-573-01 |

## Removal

### 1. T soft brake assembly removal

(1) Remove the stop washer and brake block.
(2) Remove the T soft brake assembly from the brake block.
(3) Remove the hook of the tension spring from the T soft brake assembly.



**• The main frame chassis has been omitted, in this illustration.**

Stop washer
Brake block
T soft brake assembly
Tension coil spring

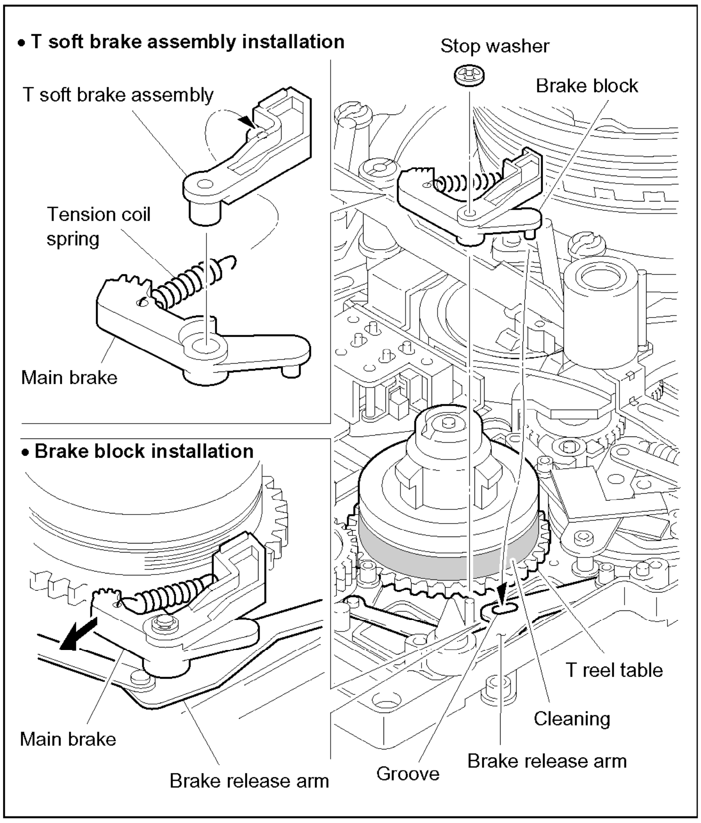
## Installation

### 2. T reel table cleaning

Clean the contact surface with the brake of the T reel table using a cleaning cloth moistened with cleaning fluid.

### 3. T soft brake assembly installation

(1) Hook the tension spring to the new T soft brake assembly.
(2) Insert the boss of the T soft brake assembly into the hole of the main brake.
(3) Insert the brake block into the shaft of the chassis and move the main brake in the direction of the arrow. This will move the pin of the main brake into the groove of the brake release arm.
(4) Install the stop washer.


• T soft brake assembly installation
T soft brake assembly
Tension coil spring
Main brake
• Brake block installation
Main brake
Brake release arm
Stop washer
Brake block
T reel table
Cleaning
Brake release arm
Groove

## Check after replacement

### 4. Brake torque check

(Refer to Section 4-1-3.)

## 3-10-14. S/T Idler Assembly Replacement

### Overviews

**Replacement**

Band holder removal (Only when replacing the S idler assembly)
S or T idler assembly removal
Cleaning of the installation shaft
S or T idler assembly installation
Band holder installation (Only when replacing the S idler assembly)

### Notes

- The S idler and T idler assemblies are composed of different parts which can be replaced in the same way.
- No adjustments are required after the replacement, but the operations of PLAY, F.FWD and REW must be checked.
- A stop washer is used for attaching the T soft brake assembly.
  When replacing the assembly, use a new stop washer (3-559-408-11).

### Preparations

1. Turn the power off.
2. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
3. Remove the cassette compartment.
   (Refer to Section 2-6 of the maintenance manual part 1.)

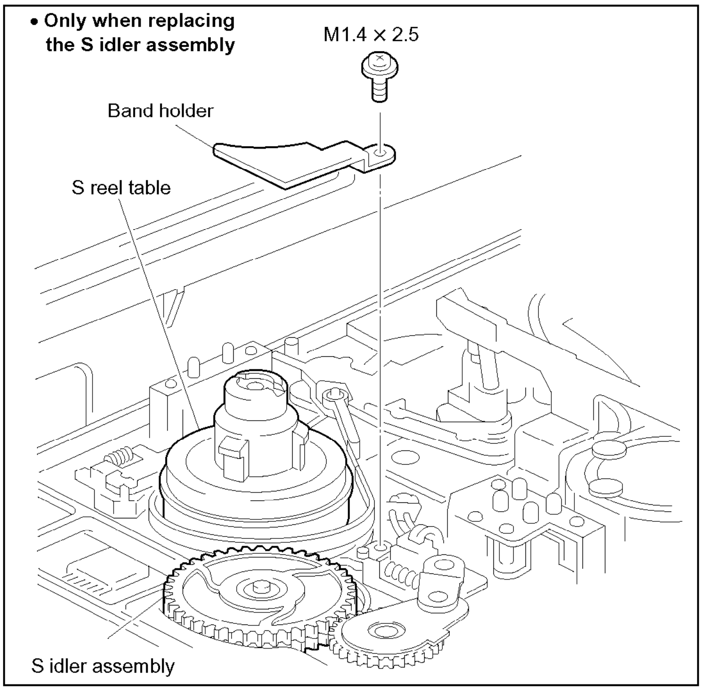
### Tools

| | |
|---|---|
| • Torque screwdriver bit (for M 1.4) : | J-6325-110-A |
| • Torque screwdriver (for 3 kg) : | J-6325-400-A |
| • Stop washer fastening tool : | J-6323-530-A |
| • Cleaning cloth : | 3-184-527-01 |
| • Cleaning fluid : | 9-919-573-01 |
| • Oil : | 7-661-018-18 |

## Removal

### 1. Band holder removal

(Only when replacing the S idler assembly)
Using the torque screwdriver bit (for M1.4) remove the screw and band holder.

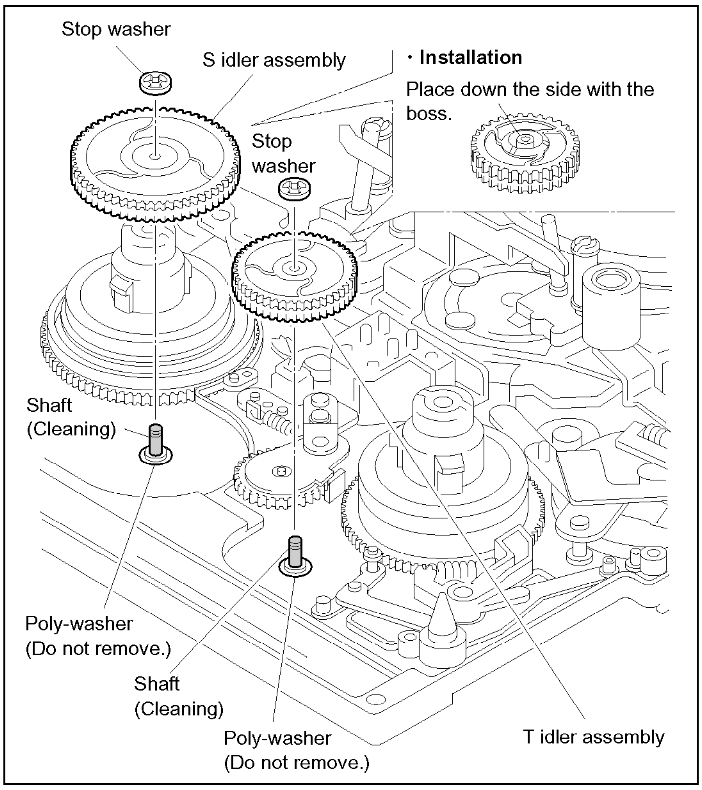

• Only when replacing the S idler assembly
M1.4 × 2.5
Band holder
S reel table
S idler assembly

### 2. S or T idler assembly removal

Remove the stop washer and S or T idler assembly.

**Note**

Do not remove the poly-washer under the S or T idler assembly from the shaft.


Stop washer
S idler assembly
Stop washer
• Installation
Place down the side with the boss.
Shaft (Cleaning)
Poly-washer (Do not remove.)
Shaft (Cleaning)
Poly-washer (Do not remove.)
T idler assembly

## Installation

### 3. Cleaning of the installation shaft

Clean the installation shaft using a cleaning piece moistened with cleaning fluid.

### 4. S or T idler assembly installation

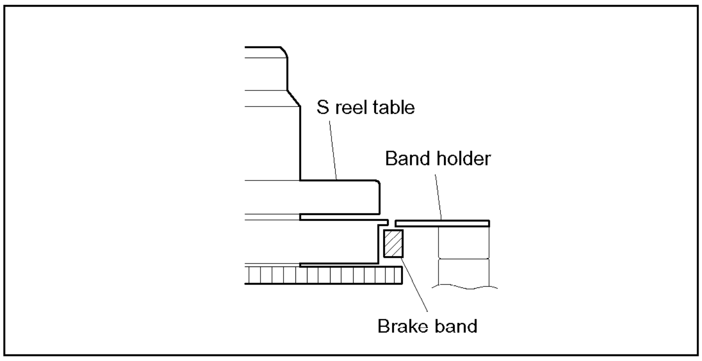
(1) Apply 1/4 drop of oil to the installation shaft and form a thin film of the oil over the shaft.
(2) Face down the side with the boss of the new S or T idler assembly downwards and insert the shaft of the chassis.
(3) Attach the stop washer.

### 5. Band holder installation

(Only when replacing the S idler assembly)
Attach the band holder as shown in the figure.

**Notes**

- Do not sandwich the brake band between the band holder and S reel table.
- Do not touch the S reel table with the band holder.


S reel table
Band holder
Brake band

## 3-10-15. Swing Gear Assembly Replacement

### Overviews

#### Replacement

Removal of the swing gear assembly fixing screw
Mechanical deck assembly removal
Swing gear assembly removal
Swing gear assembly installation
Mechanical deck assembly installation
Swing gear assembly fixation

#### Adjustment after replacement

Belt tension adjustment

### Note

When replacing, remove the mechanical deck assembly from the unit. When removing the mechanical deck assembly, be careful not to scratch the video heads, drum, and other parts.

### Preparations

1. Turn the power off.
2. Remove front lid and the outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
3. Remove the DC-DC converter.
   (Refer to Section 3-7.)

### Tools

| | |
|---|---|
| • Hexagon bit (across 1.5 mm) : | J-6326-120-A |
| • Torque screwdriver bit (for M1.4) : | J-6325-110-A |
| • Torque screwdriver bit (for M2) : | J-6325-380-A |
| • Torque screwdriver (for 3 kg) : | J-6325-400-A |

## Removal

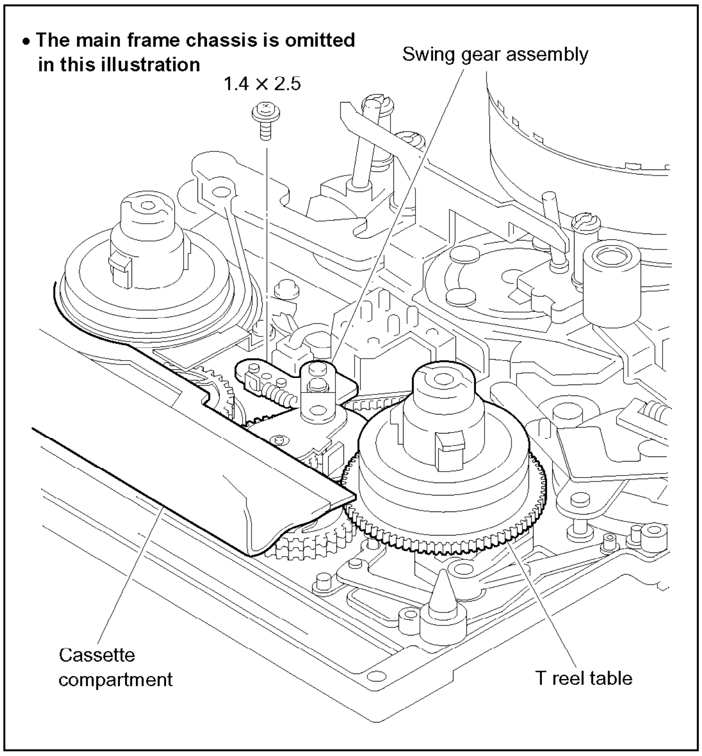
### 1. Removal of the swing gear assembly fixing screw

(1) Remove a screw.

**Notes**

The gear assembly cannot be removed from the unit even if the screw is removed.

After carrying out step 2 and removing the mechanical deck assembly, remove the swing gear assembly from the unit.


• The main frame chassis is omitted in this illustration
1.4 × 2.5
Swing gear assembly
Cassette compartment
T reel table

## 2. Mechanical deck assembly removal

(1) Remove the four screws shown in the figure using the hexagon bit.

**Note**

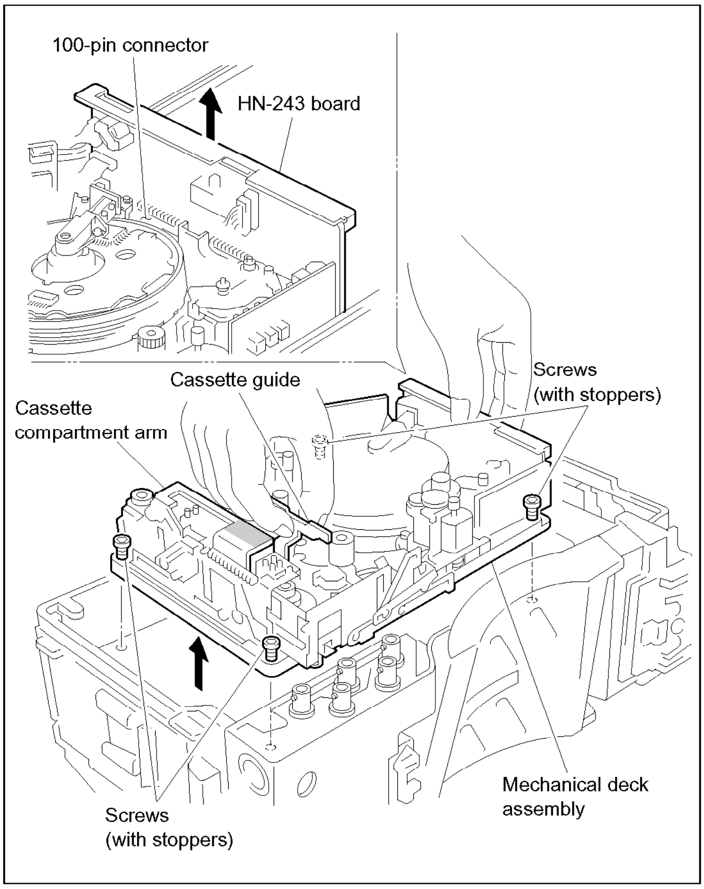
These screws cannot be removed due to the stoppers.

(2) Lift up the ornamental bracket of the HN-243 board and disconnect the 100-pin connector connected to the mother board at the bottom of the HN-243 board.

(3) While holding the shaded portion of the arm on the cassette compartment or cassette guide, and HN-243 board shown in the figure, lift up and remove the mechanical deck assembly from the unit.

**Notes**

- When removing, be careful not to scratch the video heads, drum and other parts.
- Never place the removed mechanical deck assembly with its bottom side down or up side down on the desk.
- In the replacement, place the mechanical deck assembly as shown in the figure and carry out the following steps while holding it by the hand.


100-pin connector
HN-243 board
Cassette guide
Screws (with stoppers)
Cassette compartment arm
Mechanical deck assembly
Screws (with stoppers)

### 3. Swing gear assembly removal

(1) Remove the timing belt hooked to the swing gear assembly from the back of the mechanical deck assembly.

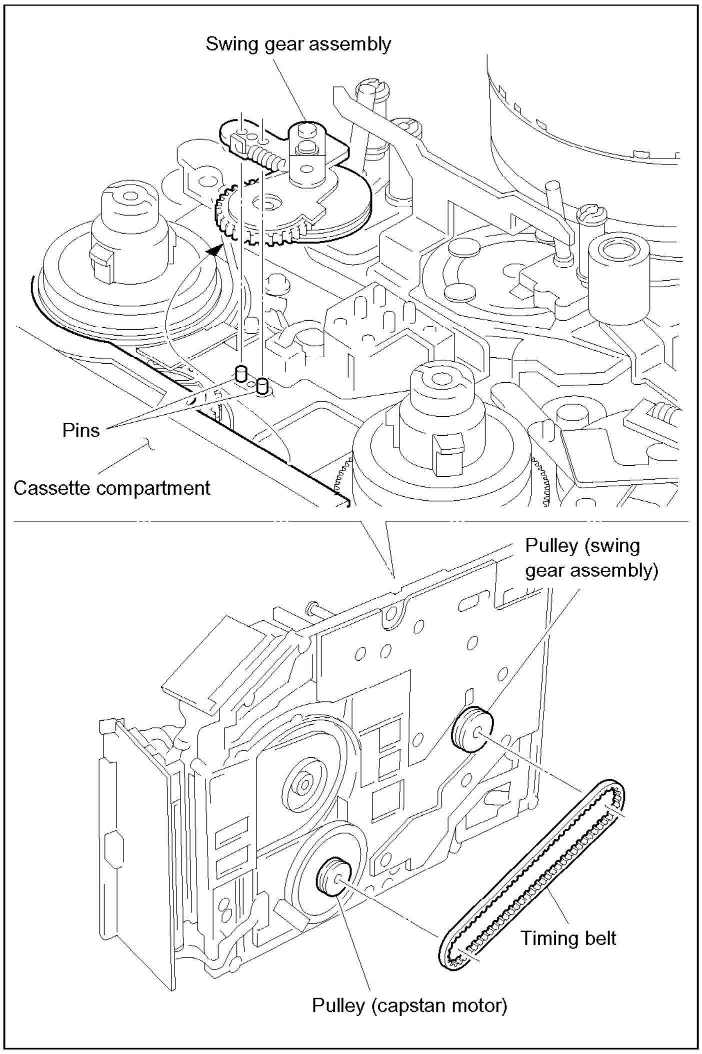
(2) Remove the swing gear assembly from the front side of the mechanical deck assembly.

## Installation

### 4. Swing gear assembly installation

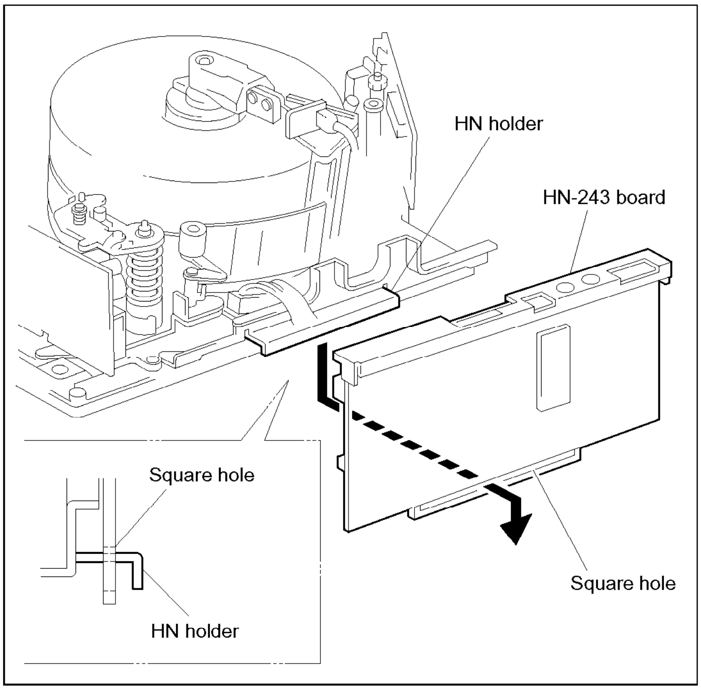
(1) While inserting the two pins of the mechanical deck assembly into the two holes of the new swing gear assembly, place the new swing gear assembly in its specified position.

(2) Attach the timing belt to the pulleys of the swing gear assembly and capstan motor.


Swing gear assembly
Pins
Cassette compartment
Pulley (swing gear assembly)
Timing belt
Pulley (capstan motor)

## 5. Mechanical deck assembly installation

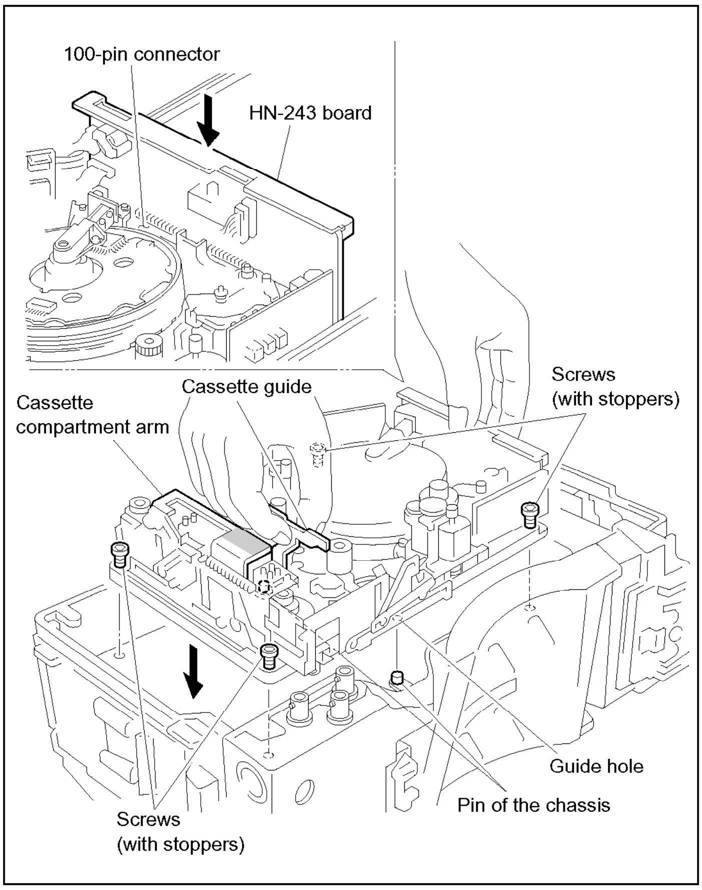
(1) Check to see that the bent portion of the HN holder of the mechanical deck assembly is inside the square hole of the reinforcement bracket attached to the HN-243 board.


HN holder
HN-243 board
Square hole
HN holder
Square hole

(2) Hold the shaded portion of the arm on the cassette compartment or cassette guide, and HN-243 board shown in the figure and align the two guide holes on the mechanical deck assembly to the two pins of the chassis.

(3) Push down the ornamental bracket of the HN-243 board and connect the 100-pin connector to the mother board.

(4) Tighten the four screws of the mechanical deck assembly.


100-pin connector
HN-243 board
Cassette compartment arm
Cassette guide
Screws (with stoppers)
Guide hole
Pin of the chassis
Screws (with stoppers)

### 6. Swing gear assembly fixation

After verifying that the two pins of the mechanical deck assembly are inside the two holes of the swing gear assembly, tighten the screw.

## Adjustment after replacement

### 7. Belt tension adjustment

(Refer to Section 4-1-4.)

## 3-10-16. Timing Belt Replacement

---

### Overviews

#### Replacement

Mechanical deck assembly removal
Timing belt removal
Cleaning of the pulleys
Timing belt installation
Mechanical deck assembly installation

#### Adjustment after replacement

Belt tension adjustment

---

### Notes

When replacing, remove the mechanical deck assembly from the unit. When removing the mechanical deck assembly, be careful not to scratch the video heads, drum, and other parts.

---

### Preparations

1. Turn the power off.
2. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
3. Remove the DC-DC converter.
   (Refer to Section 3-7.)

---

### Tools

- Hexagon bit (across 1.5 mm) : J-6326-120-A
- Torque screwdriver bit (for M1.4) : J-6325-110-A
- Torque screwdriver (for 3 kg) : J-6325-400-A
- Cleaning cloth : 3-184-527-01
- Cleaning fluid : 9-919-573-01

## Removal

### 1. Mechanical deck assembly removal

(1) Remove the four screws shown in the figure using the hexagon bit.

**Note**

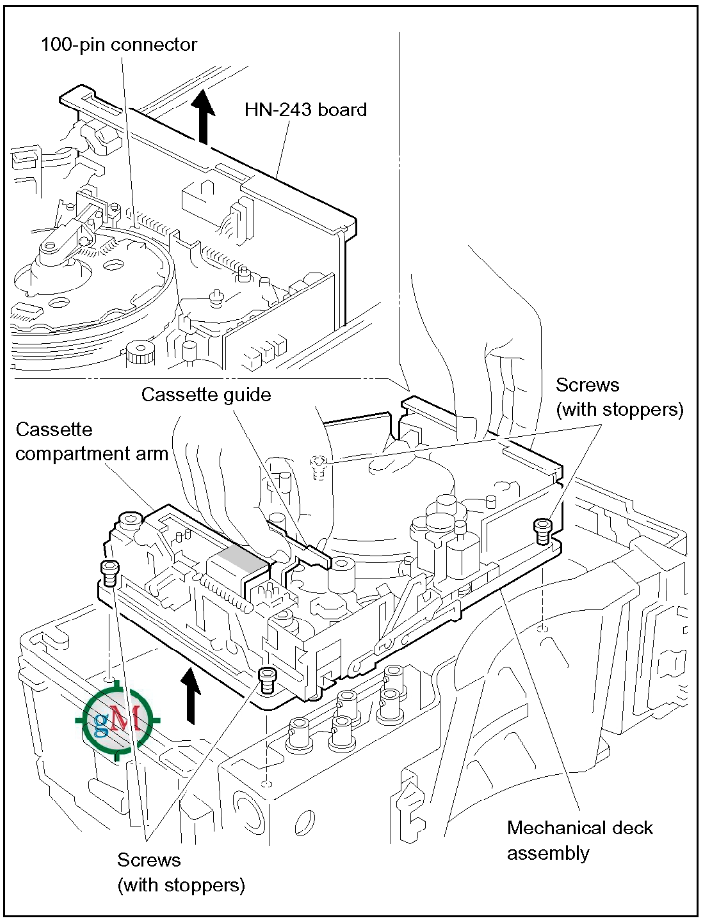
These screws cannot be removed due to the stoppers.

(2) Lift up the ornamental bracket of the HN-243 board and disconnect the 100-pin connector connected to the mother board at the bottom of the HN-243 board.

(3) While holding the shaded portion of the arm on the cassette compartment or cassette guide, and HN-243 board shown in the figure, lift up and remove the mechanical deck assembly from the unit.

**Notes**

- When removing, be careful not to scratch the video heads, drum, and other parts.
- Never place the removed mechanical deck assembly with its bottom side down or up side down on the desk.
- In the replacement, place the mechanical deck assembly as shown in the figure and carry out the following steps while holding it by the hand.


100-pin connector
HN-243 board
Cassette guide
Screws
(with stoppers)
Cassette
compartment arm
Mechanical deck
assembly
Screws
(with stoppers)

## 2. Timing belt removal

(1) Loosen the screw of the swing gear assembly.
(2) Remove the timing belt.

---

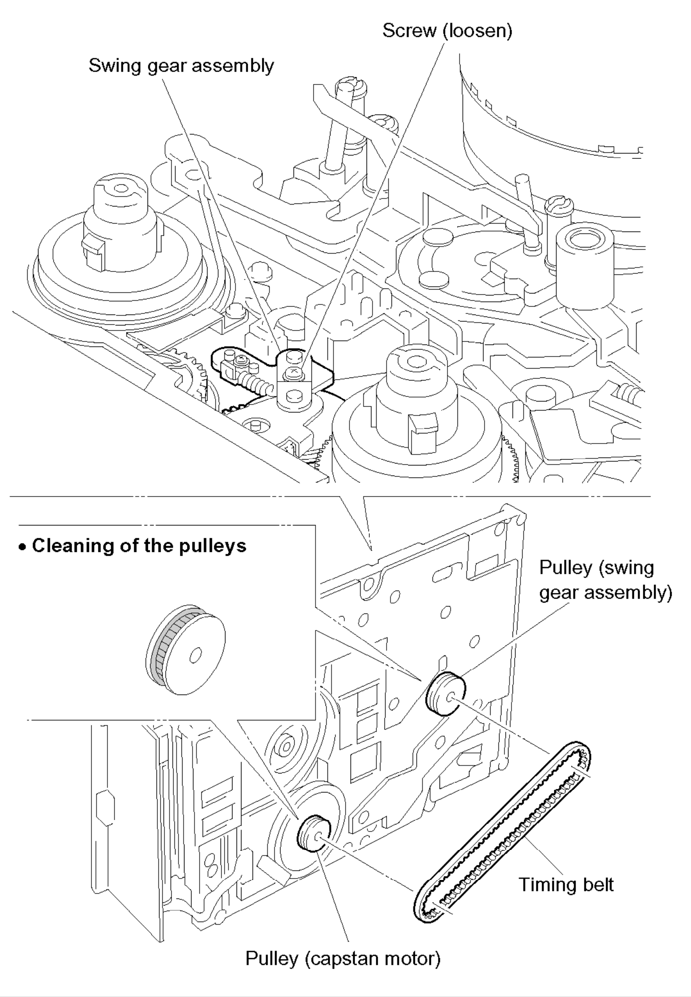
## Installation

## 3. Cleaning of the pulleys

Clean the pulleys of the swing gear assembly and capstan motor using a cleaning cloth moistened with cleaning fluid.

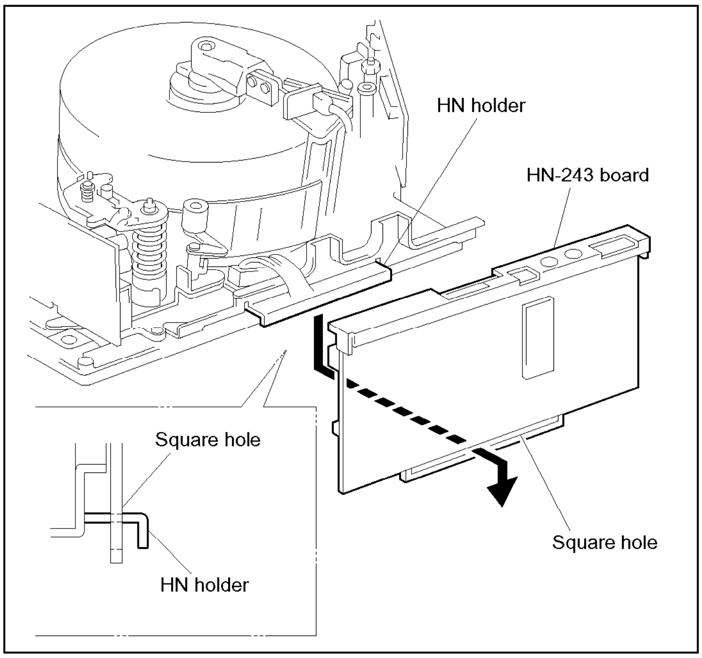
## 4. Timing belt installation

Attach the timing belt to the pulleys of the swing gear assembly and capstan motor.


Screw (loosen)
Swing gear assembly
• Cleaning of the pulleys
Pulley (swing gear assembly)
Timing belt
Pulley (capstan motor)

### 5. Mechanical deck assembly installation

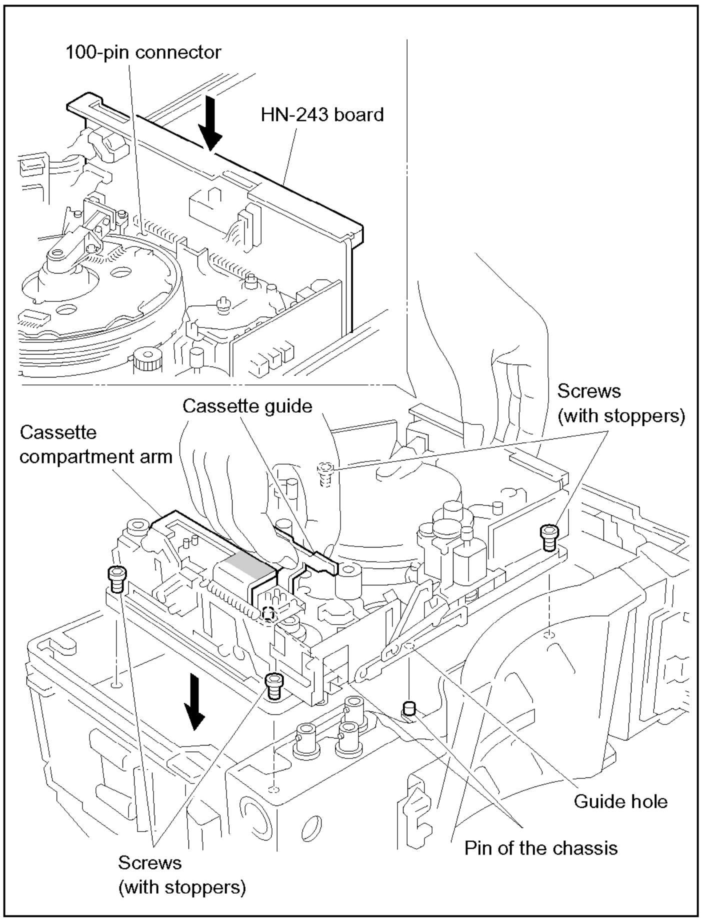
(1) Check to see that the bent portion of the HN holder of the mechanical deck assembly is inside the square hole of the reinforcement bracket attached to the HN-243 board.


HN holder
HN-243 board
Square hole
HN holder
Square hole

(2) Hold the shaded portion of the arm on the cassette compartment or cassette guide, and HN-243 board shown in the figure and align the two guide holes on the mechanical deck assembly to the two pins of the chassis.

(3) Push down the ornamental bracket of the HN-243 board and connect the 100-pin connector to the mother board.

(4) Tighten the four screws of the mechanical deck assembly.


100-pin connector
HN-243 board
Screws
(with stoppers)
Cassette guide
Cassette
compartment arm
Guide hole
Pin of the chassis
Screws
(with stoppers)

---

### Adjustment after replacement

### 6. Belt tension adjustment

(Refer to Section 4-1-4.)

## 3-10-17. Capstan Motor Replacement

### Overviews

**Replacement**

Manual eject assembly removal
Mechanical deck assembly removal
Capstan motor removal
Capstan motor installation
Mechanical deck assembly installation
Manual eject assembly installation

**Adjustments after replacement**

Belt tension adjustment
Automatic servo adjustment

### Notes

When replacing, remove the mechanical deck assembly from the unit. When removing the mechanical deck assembly, be careful not to scratch the video heads, drum, and other parts.

### Preparations

1. Turn the power off.
2. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
3. Remove the DC-DC converter.
   (Refer to Section 3-7.)

### Tools

- Hexagon bit (across 1.5 mm) : J-6326-120-A
- Torque screwdriver bit (for M2) : J-6325-380-A
- Torque screwdriver bit (for M1.4) : J-6325-110-A
- Torque screwdriver (for 3 kg) : J-6325-400-A
- Cleaning cloth : 3-184-527-01
- Cleaning fluid : 9-919-573-01

## Removal

### 1. Manual eject assembly removal

Remove the screw and the manual eject assembly. (Refer to Section 3-10-4.)

### 2. Mechanical deck assembly removal

(1) Remove the four screws shown in the figure using the hexagon bit.

**Note**

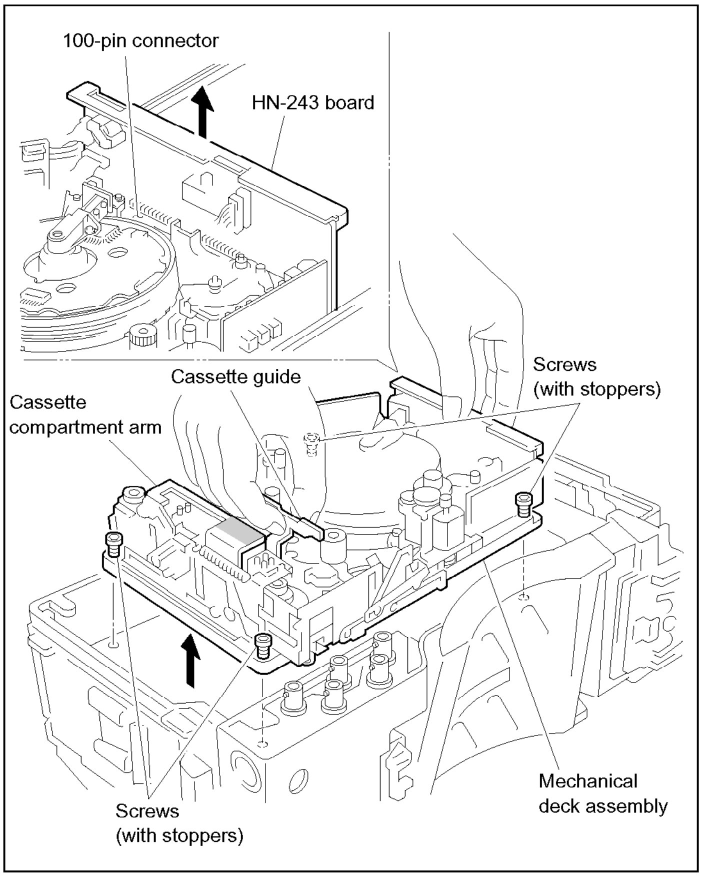
These screws cannot be removed due to the stoppers.

(2) Lift up the ornamental bracket of the HN-243 board and disconnect the 100-pin connector connected to the mother board at the bottom of the HN-243 board.

(3) While holding the shaded portion of the arm on the cassette compartment or cassette guide, and HN-243 board shown in the figure, lift up and remove the mechanical deck assembly from the unit.

**Notes**

- When removing, be careful not to scratch the video heads, drum, and other parts.
- Never place the removed mechanical deck assembly with its bottom side down or up side down on the desk.
- In the replacement, place the mechanical deck assembly as shown in the figure and carry out the following steps while holding it by the hand.


100-pin connector
HN-243 board
Cassette guide
Screws
(with stoppers)
Cassette
compartment arm
Screws
(with stoppers)
Mechanical
deck assembly

### 3. Capstan motor removal

(1) Loosen the screw of the swing gear assembly.

(2) Remove the timing belt hooked to the capstan motor pulley.

(3) Disconnect the connector connected to the board of the capstan motor.

(4) While holding the capstan motor by the hand, remove the three screws from the top surface of the mechanical deck assembly and remove the capstan motor from the back of the mechanical deck assembly.

**Note**

Be careful not to drop the capstan motor.

---

## Installation

### 4. Capstan motor installation

(1) Place the new capstan motor in the direction shown in the figure, and insert the capstan motor through the hole of the mechanical deck assembly and tighten the three screws.

**Note**

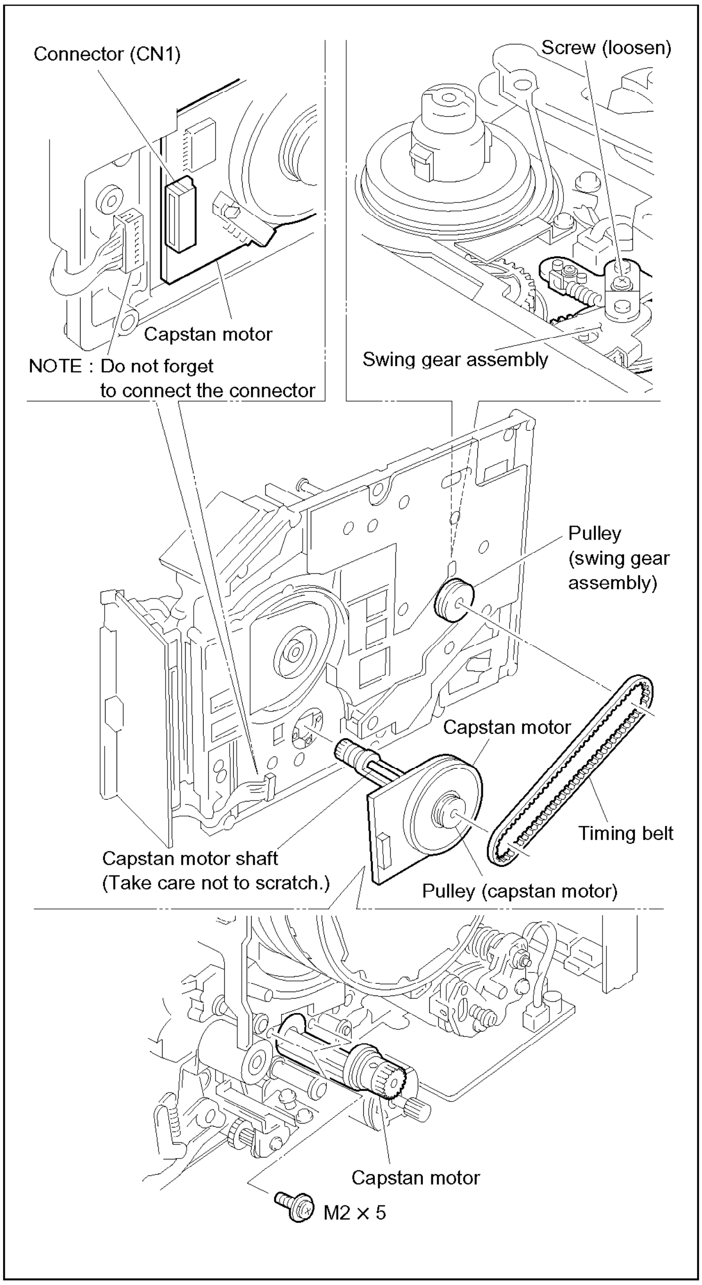
When inserting through the hole, be careful not to scratch the capstan motor shaft.

(2) Connect the connectors on the board of the capstan motor.

**Note**

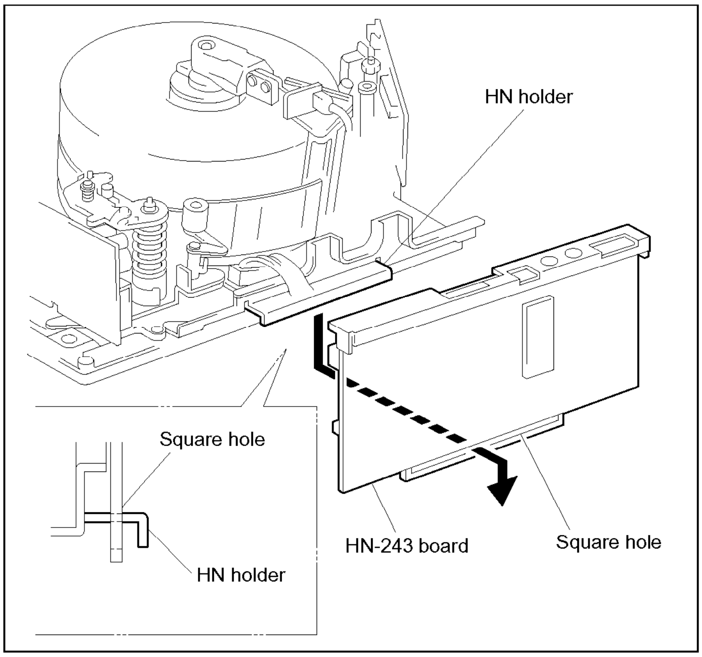
Be sure to connect connector.

(3) Attach the timing belt to the pulleys of the swing gear assembly and capstan motor.


Connector (CN1)
Capstan motor
NOTE : Do not forget
to connect the connector
Screw (loosen)
Swing gear assembly
Pulley
(swing gear
assembly)
Capstan motor
Timing belt
Capstan motor shaft
(Take care not to scratch.)
Pulley (capstan motor)
Capstan motor
M2 × 5

## 5. Mechanical deck assembly installation

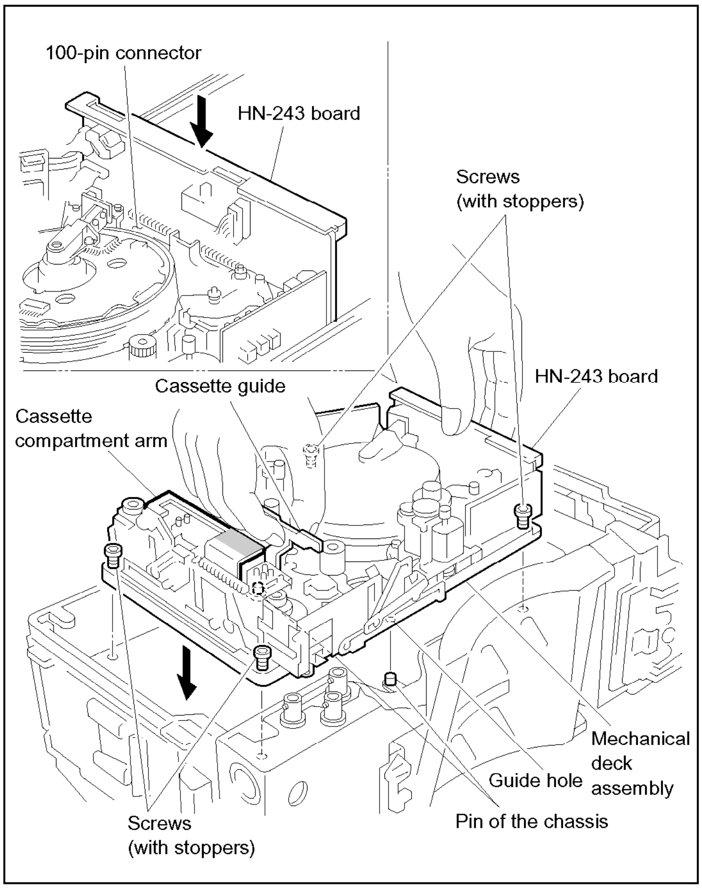
(1) Check to see that the bent portion of the HN holder of the mechanical deck assembly is inside the square hole of the reinforcement bracket attached to the HN-243 board.


HN holder
Square hole
HN holder
HN-243 board
Square hole

(2) Hold the shaded portion of the arm on the cassette compartment or cassette guide, and HN-243 board shown in the figure and align the two guide holes on the mechanical deck assembly to the two pins of the chassis.

(3) Push down the ornamental bracket of the HN-243 board and connect the 100-pin connector to the mother board.

(4) Tighten the four screws of the mechanical deck assembly.


100-pin connector
HN-243 board
Screws
(with stoppers)
Cassette guide
HN-243 board
Cassette
compartment arm
Mechanical
deck
assembly
Guide hole
Screws
(with stoppers)
Pin of the chassis

### 6. Manual eject assembly installation

(1) Attach the manual eject assembly.
(Refer to Section 3-10-4.)

(2) While pressing down the knob of the manual eject assembly, turn it in the direction or reverse direction of the arrow. When turning it, check to see that the gears engage and turn properly.

---

## Adjustments after replacement

### 7. Belt tension adjustment

(Refer to Section 4-1-4.)

### 8. Servo system adjustment

(Refer to Section 6-5.)

## 3-10-18. CTL Head Replacement

---

### Overviews

#### Replacement

Entrance head assembly removal
CTL head replacement
Entrance head assembly installation
Entrance head assembly cleaning

#### Checks after replacement

Tape running check
Video tracking check
CTL head height check
CTL head position check
CUE/TC head position check

---

### Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

---

### Tools

- Torque screwdriver bit (for M2) : J-6325-380-A
- Torque screwdriver bit (for 3 kg) : J-6325-400-A
- Cleaning cloth : 3-184-527-01
- Cleaning fluid : 9-919-573-01

## Removal

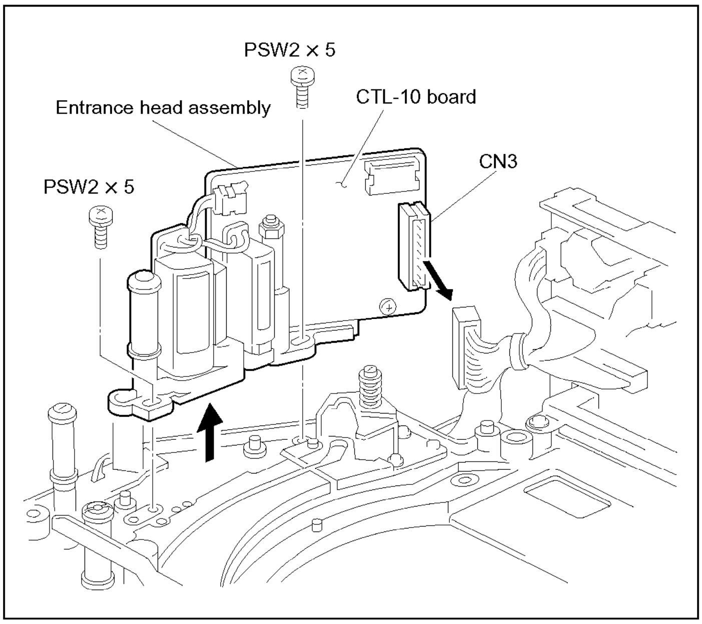
### 1. Entrance head assembly removal

(1) Disconnect the connector CN3 on the CTL-10 board.

(2) Remove the two screws and entrance head assembly from the unit.

**Note**

Be careful not to scratch the video heads, drum, FE head, tape guides, and other parts.


PSW2 × 5
Entrance head assembly
CTL-10 board
CN3
PSW2 × 5

## Installation

### 2. CTL head replacement

(1) Desolder the two leads from the CTL head.

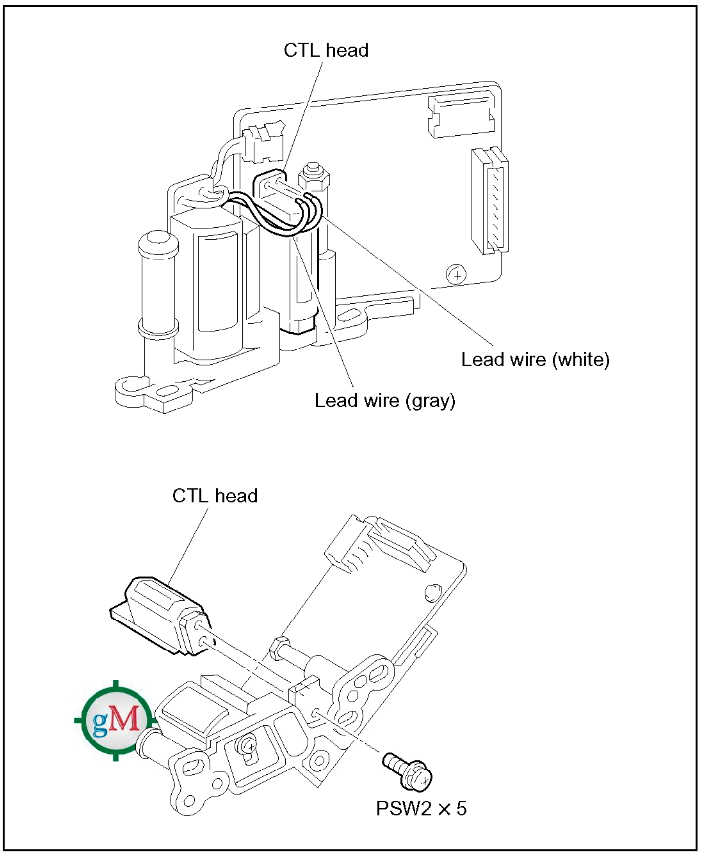
(2) Remove the screw at the back side of the CTL head assembly and CTL head.

(3) Insert the boss of CTL bracket into the hole at the bottom of the new CTL head and tighten the screw.

(4) Solder the two leads to the printed circuit board of the CTL head.

**Note**

Never solder them to wrong positions. Otherwise serious tape interchangeability trouble will occure.


CTL head
Lead wire (white)
Lead wire (gray)
CTL head
PSW2 × 5

### 3. Entrance head assembly installation

(1) Insert the two bosses of the chassis into the two reference guide holes of the entrance head assembly and tighten the two screws.

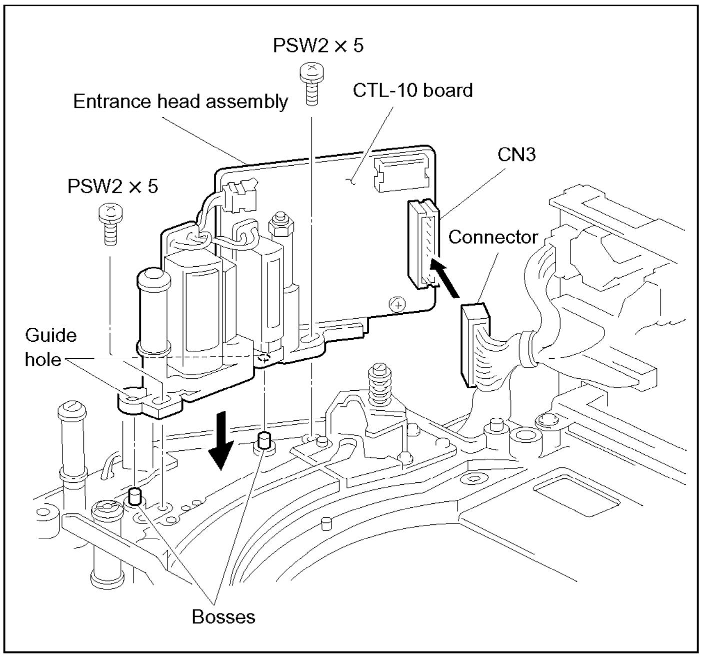
(2) Connect the harness connector to the connector CN3 on the CTL-10 board.

### 4. Entrance head assembly cleaning

(1) Clean the CTL head, FE head, tape cleaner, and tape guides using a cleaning cloth moistened with cleaning fluid.
(Refer to Section 6 of the maintenance manual part 1.)

**Note**

After cleaning, be sure to wipe using a dry cleaning cloth.


PSW2 × 5
Entrance head assembly
CTL-10 board
CN3
PSW2 × 5
Connector
Guide hole
Bosses

### Checks after replacement

5. **Tape running check**
   (Refer to Section 4-2-2.)

6. **Video tracking check**
   (Refer to Section 4-2-3.)

7. **CTL head height check**
   (Refer to Section 4-2-4.)

8. **CTL head position check**
   (Refer to Section 4-2-5.)

9. **CUE/TC head position check**
   (Refer to Section 4-2-9.)

## 3-10-19. CUE Head Replacement

### Overviews

### Replacement

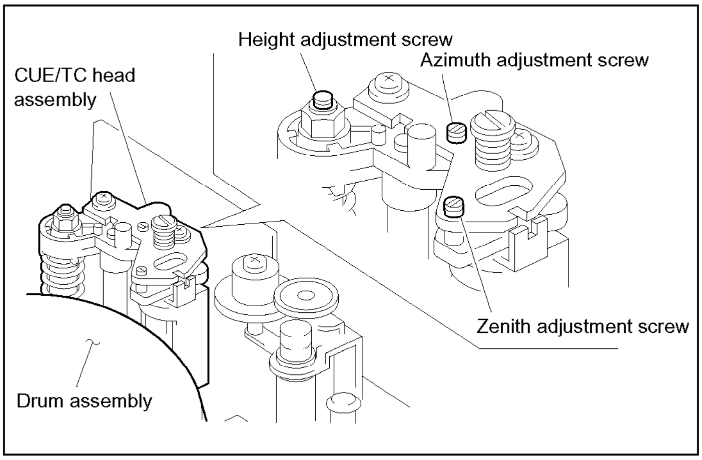
Manual eject assembly removal
Cassette compartment removal
Gear block assembly removal
CUE head block assembly removal
CUE head replacement
CUE head block installation
Gear block assembly installation
Cleaning of the head
Cassette compartment installation
Manual eject assembly installation
Operation check

### Adjustments/checks after replacement

Tape running check
Video tracking check
CUE head height check
CTL head position check
CUE/TC head position check
Audio system adjustment

### Notes

- When replacing, never tighten or loosen other screws except the relevant screws described in the following steps.
  If tightened or loosened, the azimuth and zenith of the CUE head will change, and affect the tape path and video tracking adjustments.
- A stop washer is used for attaching the T soft brake assembly.
  When replacing the assembly, prepare a new stop washer (3-559-408-11).


Height adjustment screw
Azimuth adjustment screw
CUE/TC head assembly
Zenith adjustment screw
Drum assembly

## Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

## Tools

| | |
|---|---|
| • Torque screwdriver bit (for M1.4) : | J-6325-110-A |
| • Torque screwdriver bit (for M2) : | J-6325-380-A |
| • Torque screwdriver (for 3kg) : | J-6325-400-A |
| • Stop washer fastening tool : | J-6323-530-A |
| • Cleaning cloth : | 3-184-527-01 |
| • Cleaning fluid : | 9-919-573-01 |

## Removal

### 1. Manual eject assembly removal

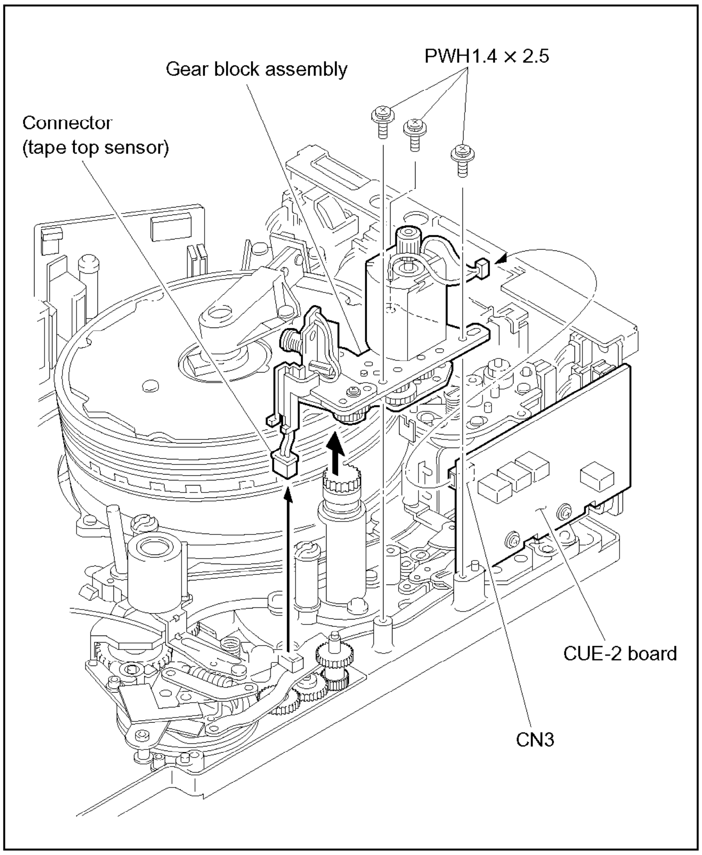
Remove the screw and manual eject assembly. (Refer to Section 3-10-4.)

### 2. Cassette compartment removal

Remove the three screws and cassette compartment. (Refer to Section 2-6 of the maintenance manual part 1.)

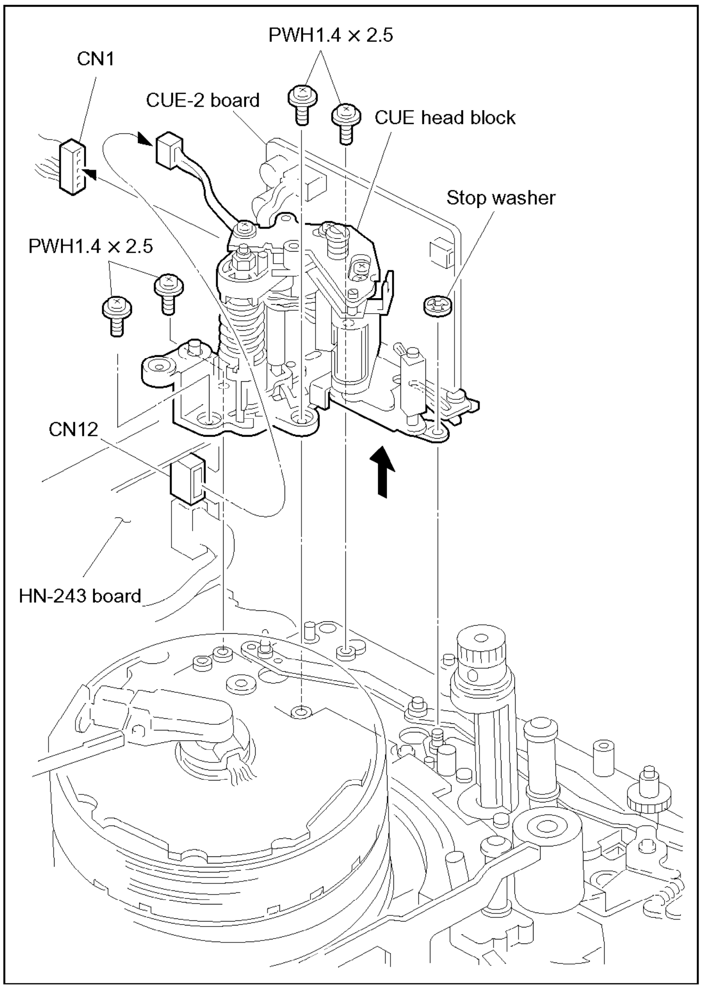
### 3. Gear block assembly removal

(1) Disconnect CN3 on the CUE-2 board attached to the CUE head block.
(2) Remove the three screws.
(3) Lift up the gear block assembly and disconnect the connector of the tape top sensor from the SE-275 board. This will detach the gear block assembly.



### 4. CUE head block assembly removal

(1) Disconnect CN12 on the HN-243 board.
(2) Remove the video head cleaner assembly. (Refer to Section 3-10-10.)
(3) Remove the four screws and stop washer on the CUE cleaner link and remove the CUE head block.
(4) Disconnect the connector of the CUE head block from CN1 on the CUE-2 board.


PWH1.4 × 2.5
CN1
CUE-2 board
CUE head block
Stop washer
PWH1.4 × 2.5
CN12
HN-243 board

## Installation

### 5. CUE head replacement

(1) Disconnect CN2 on the CUE-2 board.

(2) Remove the screw and open the CUE-2 board.

(3) Remove the two screws (PSW2 × 5) and CUE head. This will detach the shield case and adjustment plate (R).

(4) Desolder the four leads from the printed circuit board of the CUE head, and re-solder them to the new CUE head.

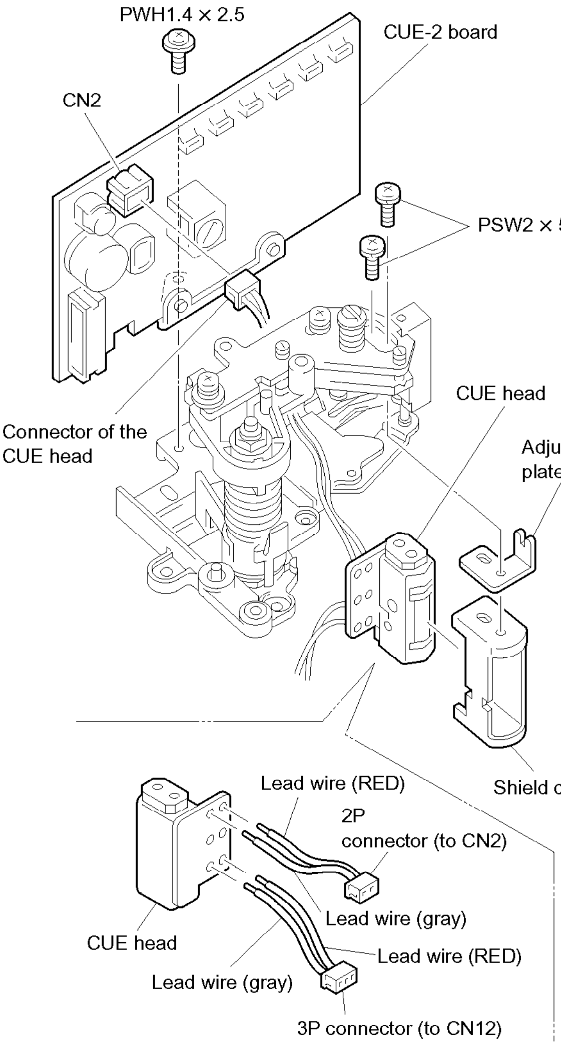
**Note**

Never solder them to wrong positions.

(5) After inserting the new CUE head in the shield case, assemble the parts in the sequence shown in the figure and tighten the two screws.

(6) Attach the CUE-2 board using the two screws.

(7) Connect the harness connector from the CUE head to the connector CN2 on the CUE-2 board.


PWH1.4 × 2.5
CUE-2 board
CN2
PSW2 × 5
CUE head
Connector of the CUE head
Adjustment plate (R)
Shield case
Lead wire (RED)
2P connector (to CN2)
Lead wire (gray)
CUE head
Lead wire (RED)
Lead wire (gray)
3P connector (to CN12)

## 6. CUE head block installation

(1) Align the CUE link assembly at the position shown in the figure by the hand.

**Reference**

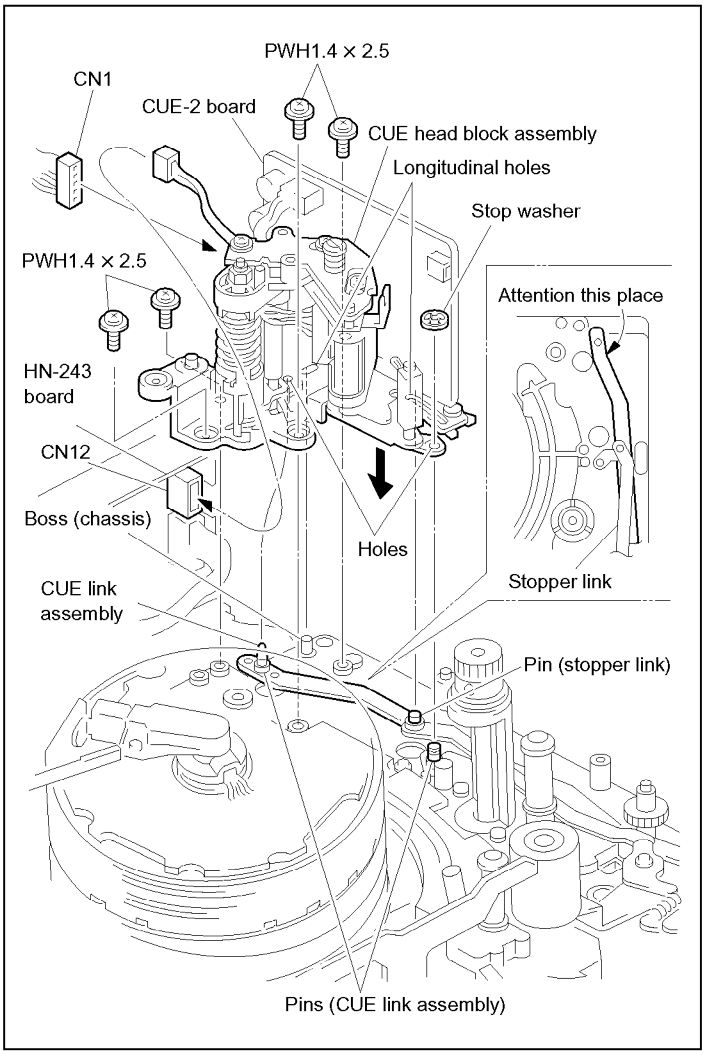
In this way the following steps will easily carry out.

(2) Insert the two pins of the CUE link assembly in the two holes of the CUE head block assembly. Insert the pin of the stopper link and the boss of the chassis in the two longitudinal holes of the CUE head block assembly.

(3) Attach the CUE head block to the chassis using the four screws.

(4) Attach the stop washer to the pin of the CUE link assembly.

(5) Connect the connectors of the CUE head block to CN12 on the HN-243 board and CN1 on the CUE-2 board.


PWH1.4 × 2.5
CN1
CUE-2 board
CUE head block assembly
Longitudinal holes
Stop washer
PWH1.4 × 2.5
Attention this place
HN-243 board
CN12
Boss (chassis)
Holes
Stopper link
CUE link assembly
Pin (stopper link)
Pins (CUE link assembly)

## 7. Gear block assembly installation

(1) While connecting the connector of the tape top sensor connected to the gear block assembly to the connector on the SE-275 board attached to the chassis, insert the pin of the chassis in the longitudinal hole of the gear block assembly and the top of the joint gear attached to the chassis in the round hole of the gear block assembly. Tighten the three screws.

**Reference**

Check to see that the connector connects to the SE-275 board.

(2) Connect the connector of the gear motor to the connector CN3 on the CUE-2 board.

(3) Attach the VH cleaner assembly.
(Refer to Section 3-10-10.)

## 8. Cleaning of the head

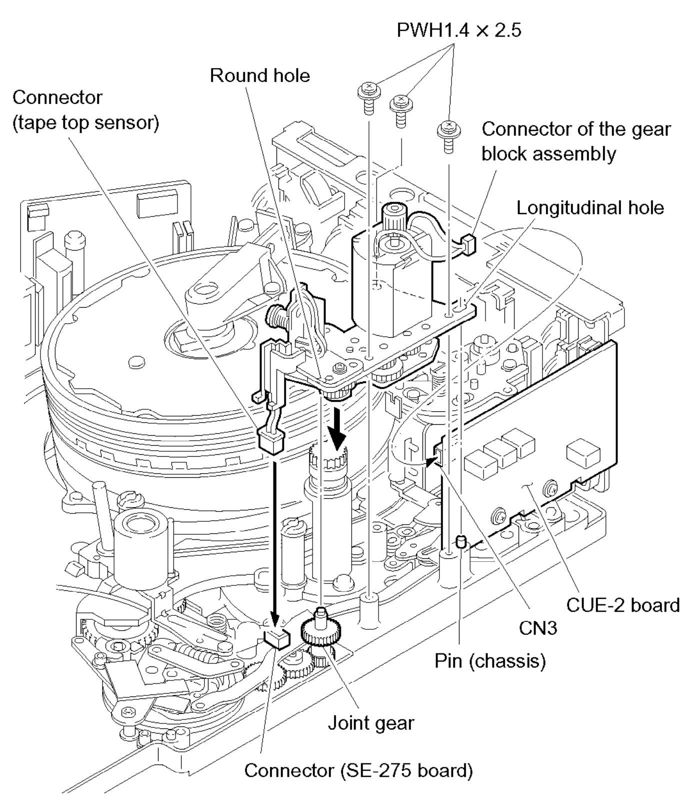
(1) Clean the CUE head using a cleaning piece moistened with cleaning fluid.
(Refer to Section 6-1-4 of the maintenance manual part 1.)

**Note**

After cleaning, be sure to wipe using a dry cleaning cloth.

## 9. Cassette compartment installation

Attach the cassette compartment using the three screws. (Refer to Section 2-6 of the maintenance manual part 1.)


PWH1.4 × 2.5
Round hole
Connector
(tape top sensor)
Connector of the gear block assembly
Longitudinal hole
CUE-2 board
CN3
Pin (chassis)
Joint gear
Connector (SE-275 board)

### 10. Manual eject assembly installation

Attach the manual eject assembly.
(Refer to Section 3-10-4.)

### 11. Operation check

When turning the manual eject knob clockwise and counterclockwise, check to see that the cleaning roller assembly moves and cleans the CUE head. (Refer to Section 3-10-4.)

---

## Adjustments/checks after replacement

### 12. Tape running check

(Refer to Section 4-2-2.)

### 13. Video tracking check

(Refer to Section 4-2-3.)

### 14. CUE head height check

(Refer to Section 4-2-6.)

### 15. CTL head position check

(Refer to Section 4-2-5.)

### 16. CUE/TC head position check

(Refer to Section 4-2-9.)

### 17. Audio system adjustment

(Refer to Section 6-6.)

## 3-10-20. Reel Table Replacement

### Overviews

### Replacement

Reel table removal
Reel shaft cleaning
Reel table cleaning
Reel table installation (1)
Reel table height adjustment
Reel table installation (2)
Operation check

### Checks after replacement

FWD back tension check
Brake torque check
Tape running check

### Notes

- A new stop washer is required for attaching the S reel table. Prepare a new one when replacing the S reel table.
  Stop washer : 3-559-408-11
- Five poly washers are attached at the top and bottom of the S reel table. (The T reel table is the same.) The poly washers at the top of the reel table are spare parts for replacing the reel table. Be careful not to lose and break.
  Poly washer 2 ø (0.13 mm thick) : 3-303-961-01
- The height of the S and T reel tables serves as the reference for the tape running system. After replacing the S or T reel table, be sure to carry out the S or T reel table height adjustment.

### Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
4. Remove the cassette compartment.
   (Refer to Section 2-6 of the maintenance manual part 1.)

## Tools

| | |
|---|---|
| • Stop washer fastening tool : | J-6323-530-A |
| • FWD back tension measuring cassette tape : | J-6323-890-A |
| • Cassette reference plate (1) : | J-6324-170-A |
| • Reel table height adjustment tool : | J-6324-150-A |
| • Cleaning cloth : | 3-184-527-01 |
| • Cleaning fluid : | 9-919-573-01 |

## Removal

### 1. Reel table removal

S reel table removal

(1) Remove a screw and the band holder.

(2) Remove the stop washer and the brake band from the tension regulator arm.

(3) Move the brake band to the S idler side.

**Note**

Do not bend the brake band. Do not apply oil to the felt surface.

(4) Remove the stop washer attached to the S reel table using a pair of tweezers (or equivalent).

(5) Remove one through three poly washer (s) at the top of the S reel table.

(6) Pull out the S reel table while releasing the S soft brake and the brake band using the finger from the S reel table.

**Note**

Do not touch the felt surface of the brake band with the finger.

T reel table removal

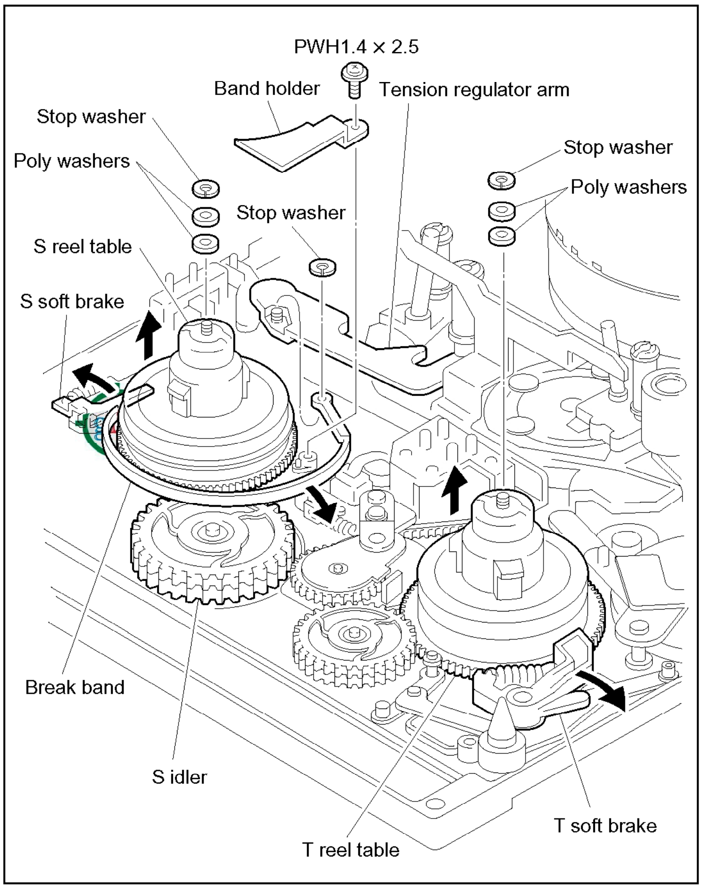
(1) Remove the stop washer attached to the T reel table.

(2) Remove one through three stop washer (s) at the top of the T reel table.

(3) Pull out the T reel table while releasing the T soft brake using the finger from the T reel table.

**Note**

If poly washers are attached to the bottom of the reel table, return them to the reel shaft.


PWH1.4 × 2.5
Band holder
Tension regulator arm
Stop washer
Poly washers
Stop washer
Poly washers
Stop washer
S reel table
S soft brake
Break band
S idler
T reel table
T soft brake

## Installation

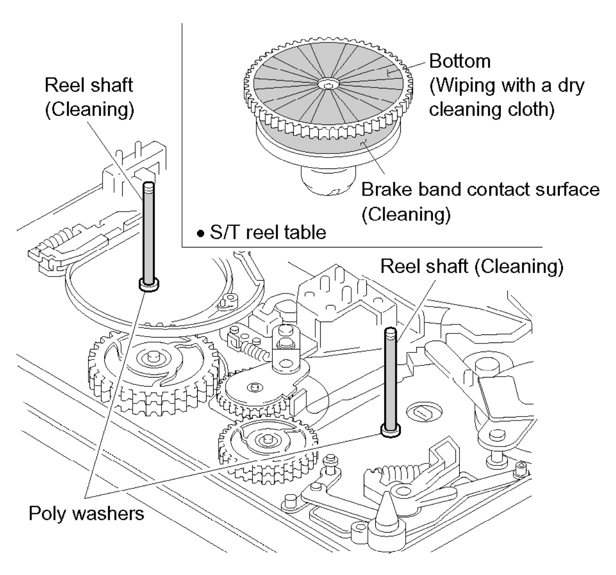
### 2. Reel shaft cleaning

Clean the reel shaft using a cleaning cloth moistened with cleaning fluid.

### 3. Reel table cleaning

(1) Clean the contact surfaces of the reel table with the brake band using a cleaning cloth moistened with cleaning fluid.

(2) Wipe the bottom sides of the reel table using a dry cleaning cloth.


Reel shaft
(Cleaning)
Bottom
(Wiping with a dry cleaning cloth)
Brake band contact surface
(Cleaning)
• S/T reel table
Reel shaft (Cleaning)
Poly washers

### 4. Reel table installation (1)

Pass the reel shaft through the reel table while releasing the soft brake using the finger.

### 5. Reel table height adjustment

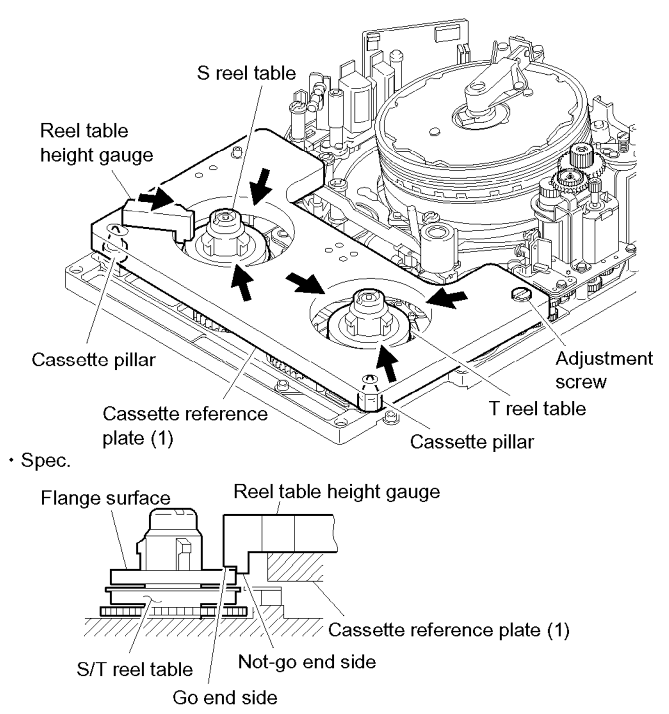
(1) Place the cassette reference plate (1) onto the two cassette pillar as shown in the figure. Turn the adjustment screw on the cassette reference plate (1) to eliminate play between the cassette reference plate (1) and cassette pillars.

(2) Move the reel table height gauge on the flange surface of the reel tables every 120 degrees and check to see that the specification is satisfied.

(3) If it is not, increase or decrease the number of poly washers at the bottom of the reel table.

**Reference**

If the height of the reel table is smaller than the specification, insert the poly washer (s) at the top of the reel table in the bottom and re-adjust.


S reel table
Reel table
height gauge
Cassette pillar
Adjustment
screw
T reel table
Cassette reference
plate (1)
Cassette pillar
• Spec.
Flange surface
Reel table height gauge
Cassette reference plate (1)
S/T reel table
Not-go end side
Go end side

Spec. : The passing side of the gauge slides over the flange of the reel table. The stopping side of the gauge blocks the flange of the reel table.
• Deference between the passing side and stopping side : 0.2 mm

## 6. Reel table installation (2)

### S Reel table installation

(1) Pass the S reel shaft through the remaining poly washer (s) in step 5.

(2) Attach the S reel table using the new stop washer.

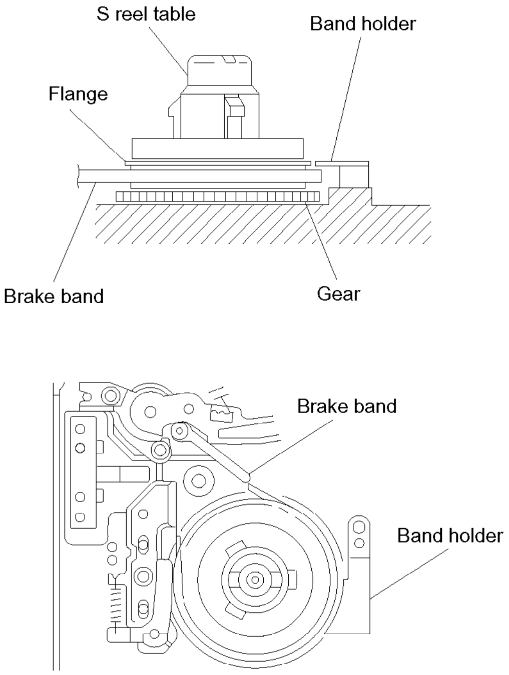
(3) Move the S reel table in the vertical direction and check to see that it moves slightly. If it does not move, remove the poly washer at the top of the S reel table.

(4) Attach the brake band to the tension regulator arm using the new stop washer.

(5) Attach the band stopper by one screw.

**Reference**

Follow the "Note on installation".



Note on installation
- Check that the band is between flange and gear.
- Do not rub the band holder against the reel table.
- Do not sandwich the band between the band holder and reel table.

### T reel table installation

(1) Pass the T reel shaft through the remaining poly washer (s) in the step 5.

(2) Attach the T reel table using the new stop washer.

(3) Move the T reel table in the vertical direction and check to see that it moves slightly. If is does not move, remove the poly washer at the top of the T reel table.

### 7. Operation check

Turn lightly the reel table while releasing the soft brake using finger. Check to see that the reel table and the idler rotate freely.

## Checks after replacement

### 8. FWD back tension check

Only when replacing the S reel table
(Refer to Section 4-1-2.)

### 9. Brake torque check

(Refer to Section 4-1-3.)

### 10. Tape running check

(Refer to Section 4-2-2.)

## 3-10-21. Pinch Arm Assembly Replacement

---

### Overviews

#### Replacement

Pinch arm assembly removal
Installing shafts cleaning
Applying oil to installing shafts
Pinch arm assembly installation
Pinch roller cleaning

#### Check after replacement

Tape running check

---

### Notes

- New stop washers are required for attaching the pinch assembly. Use new stop washers when replacing the pinch assembly.
  Stop washer : 3-559-408-11 (Use three pieces)

---

### Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
4. Remove the cassette compartment.
   (Refer to Section 2-6 of the maintenance manual part 1.)

---

### Tools

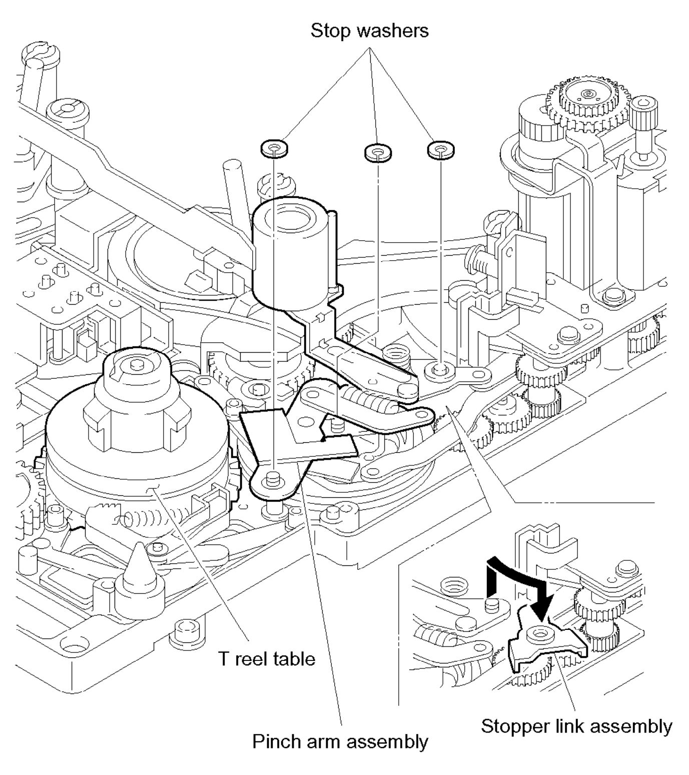
| | |
|---|---|
| • Stop washer fastening tool: | J-6323-530-A |
| • Cleaning cloth : | 3-184-527-01 |
| • Cleaning fluid : | 9-919-573-01 |

## Removal

### 1. Pinch arm assembly removal

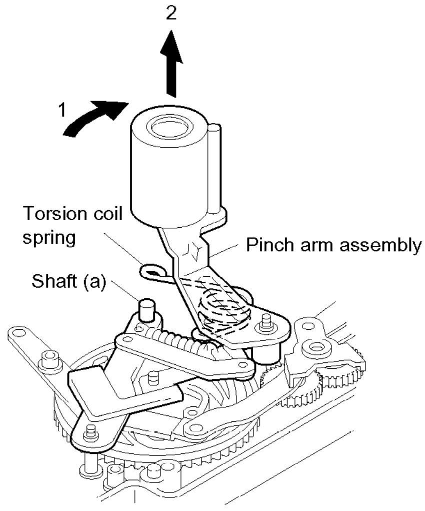
(1) Remove the three stop washers using a pair of tweezers (or equivalent).

(2) Turn and lift up the stopper link assembly in the direction of the arrow as shown in the figure.


Stop washers
T reel table
Pinch arm assembly
Stopper link assembly

(3) Lift up the pinch arm assembly 2 to 3 mm. Remove the tortion coil spring from the groove of the shaft (a) while moving the pinch roller toward the capstan. (Arrow1)

(4) Lift straight up and remove the pinch arm assembly. (Arrow2)


2
1
Torsion coil spring
Shaft (a)
Pinch arm assembly

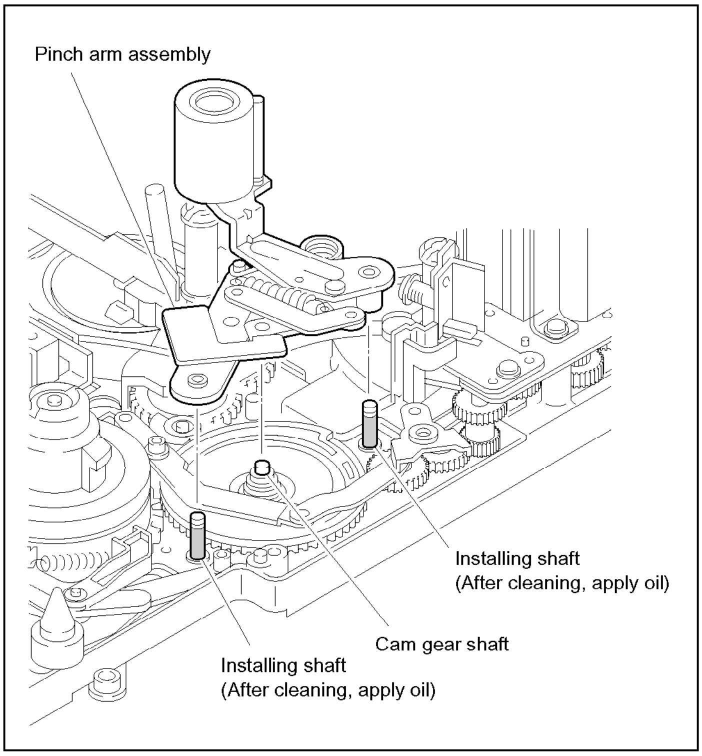
## Installation

### 2. Installing shafts cleaning

Clean the two installing shafts using a cleaning cloth moistened with cleaning fluid.

### 3. Applying oil to installing shafts

Apply 1/2 drop of oil to the two installing shafts.


Pinch arm assembly
Installing shaft
(After cleaning, apply oil)
Cam gear shaft
Installing shaft
(After cleaning, apply oil)

### 4. Pinch arm assembly installation

(1) Shape the pinch arm assembly as shown in the fig-1.

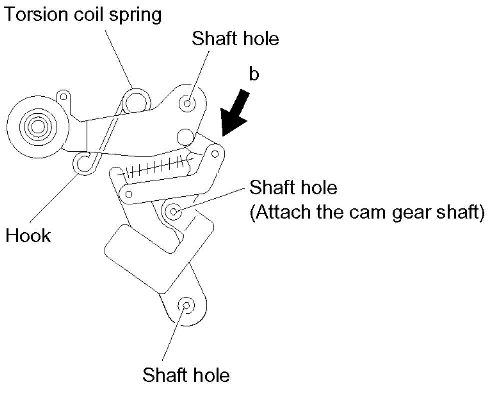

Torsion coil spring
Shaft hole
b
Shaft hole
(Attach the cam gear shaft)
Hook
Shaft hole

Fig-1

(2) Insert the two installing shafts of the mechanical chassis assembly into the two holes on the pinch arm assembly 2 to 3 mm.

**Note**

Move the coil portion of the torsion coil spring from the shaft (a) to the capstan motor side.

(3) Insert the shaft (a) into the hook of the torsion coil spring while holding the pinch arm assembly so that it does not rotate in the direction of the capstan.

(4) While pressing the portion (b) in the direction of the arrow shown in the fig-1, press the pinch arm assembly against the chassis and attach the pinch assembly to the two installing shafts and the cam gear shaft.

(5) Insert the installing shaft into the stopper link asembly to hold the pinch arm assembly as shown in the fig-4.

(6) Attach the pinch arm assembly using the three stop washers.

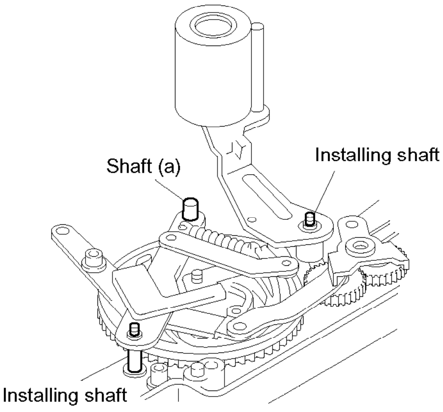

Shaft (a)
Installing shaft
Installing shaft

Fig-2

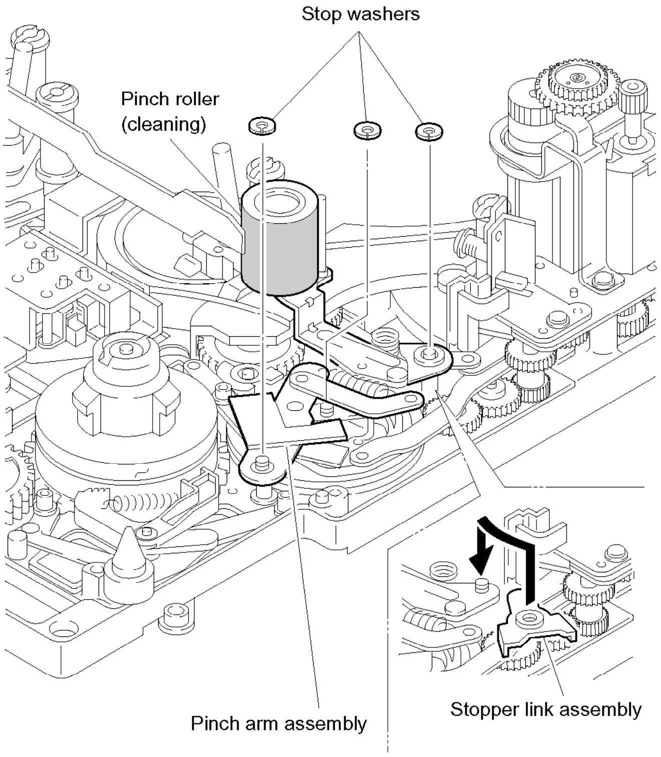

Stop washers
Pinch roller (cleaning)
Pinch arm assembly
Stopper link assembly

Fig-3

Fig-4

## 5. Pinch roller cleaning

Clean the surface of the pinch roller using a cleaning cloth moistened with cleaning fluid after attaching.

## Check after replacement

## 6. Tape running check

(Refer to Section 4-2-2.)

## 3-10-22. Sensor (A) Detection Pin Replacement

### Overviews

#### Replacement

Sensor cover (A) removal
Detection pins installation
Sensor cover (A) installation
Operation Check

### Preparations

1. Turn the power off.
2. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

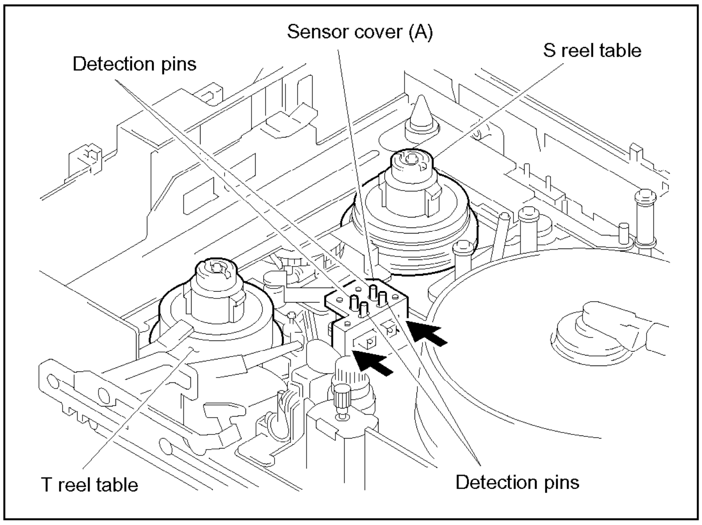
**Reference**

The detection pins for the sensor cover (A) can be replaced with the cassette compartment attached to the unit. Replacement is easier with the cassette guide removed.

### Removal

#### 1. Sensor cover (A) removal

While holding the position shown in the figure using a pair of tweezers (or equivalent), remove the sensor cover (A) upwards. This will detach the detection pins.



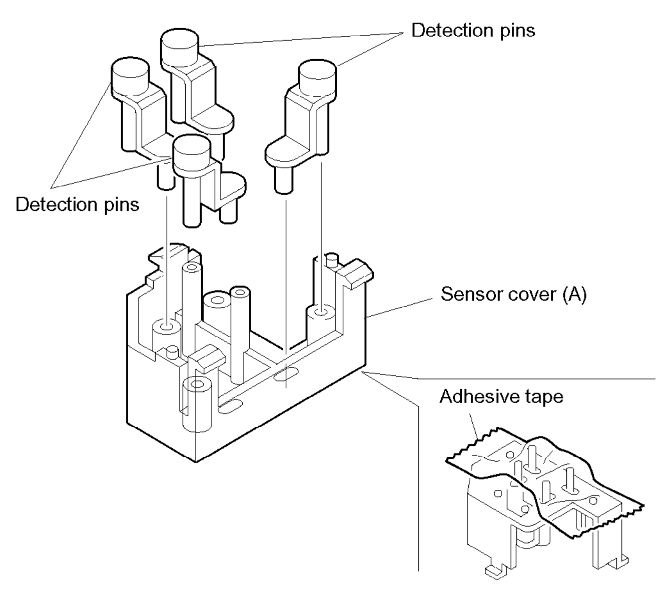
## Installation

### 2. Detection pins installation

Attach the detection pins to the sensor cover (A) in the direction of the arrow shown in the figure.

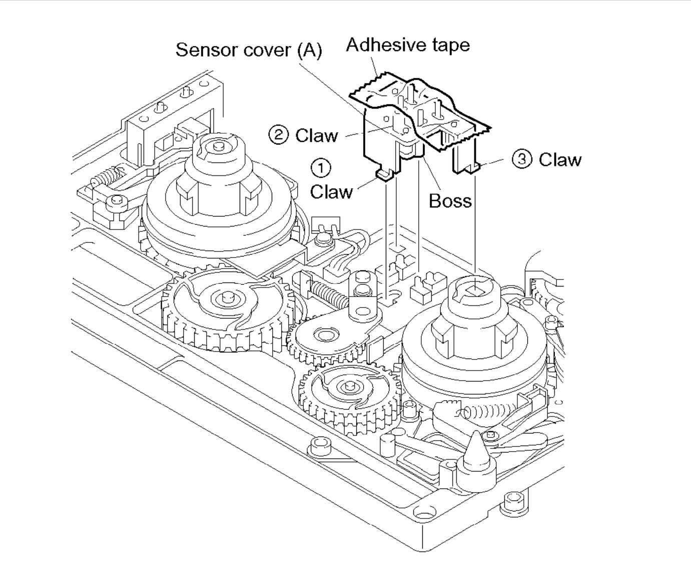
**Reference**

When attaching the sensor cover (A), to prevent the detection pins from falling, it is recommended that adhesive tape be pasted at the position shown in the figure. After carrying out step 3, peel off the tape and make sure that it is not pasted to the outer circumference of the detection pins.


Detection pins
Detection pins
Sensor cover (A)
Adhesive tape

### 3. Sensor cover (A) installation

Insert the boss and claws of the sensor cover (A) in the four holes on the SE-275 board in the order shown in the figure and attach.


Sensor cover (A)
Adhesive tape
② Claw
① Claw
Boss
③ Claw

### 4. Operation check

Check to see that the detection pins move freely in the vertical direction and return to the original position.

## 3-10-23. Sensor (B) Detection Pin Replacement

### Overviews

**Replacement**

Sensor cover (B) removal
Detection pins installation
Sensor cover (B) installation
Operation Check

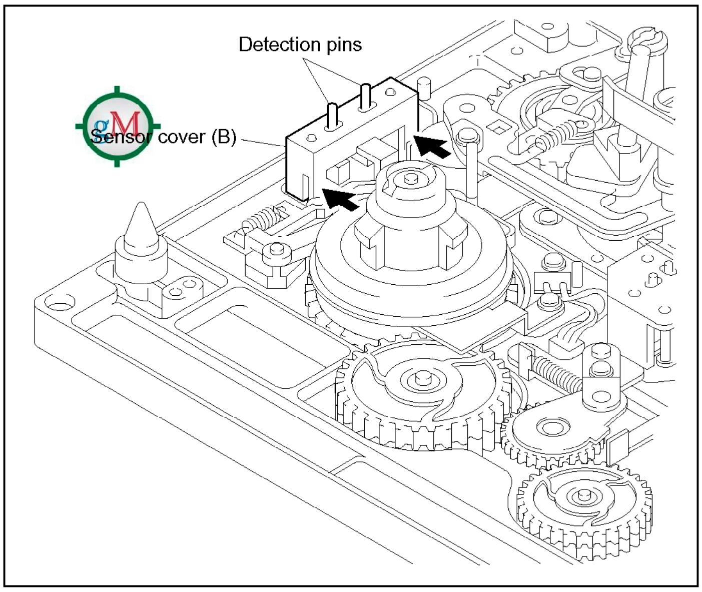
### Preparations

1. Turn the power off.
2. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
3. Remove the cassette compartment.
   (Refer to Section 2-6 of the maintenance manual part 1.)

### Removal

#### 1. Sensor cover (B) removal

While holding the position shown in the figure using a pair of tweezers (or equivalent), remove the sensor cover (B). This will detach the detection pins.



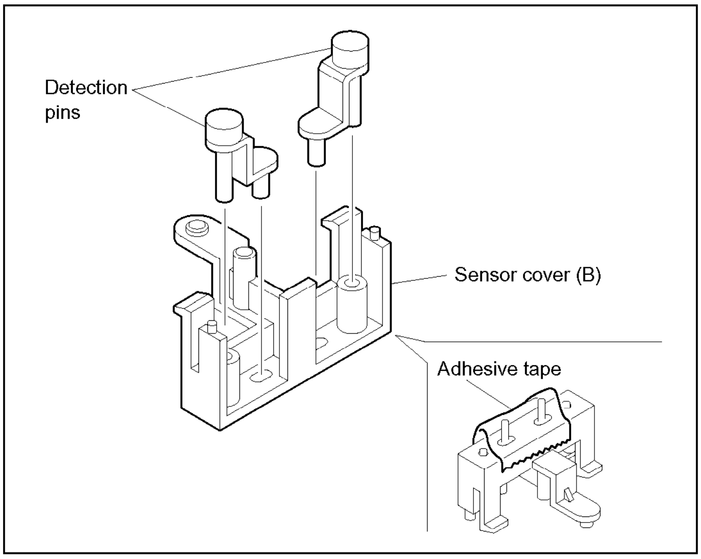
## Installation

### 2. Detection pins installation

Attach the detection pins to the sensor cover (B) in the direction of the arrow shown in the figure.

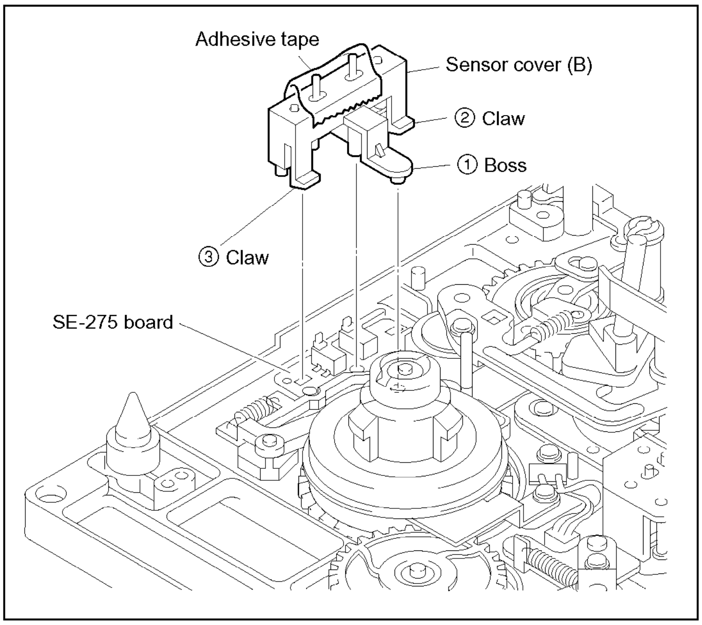
**Reference**

When attaching the sensor cover (B), to prevent the detection pins from falling, it is recommended that adhesive tape be pasted at the position shown in the figure. After carrying out step 3, peel off the tape and make sure that it is not pasted to the outer circumference of the detection pins.


Detection pins
Sensor cover (B)
Adhesive tape

### 3. Sensor cover (B) installation

Insert the boss and claws of the sensor cover (B) into the four holes on the SE-275 board in the order shown in of the figure and attach.


Adhesive tape
Sensor cover (B)
② Claw
① Boss
③ Claw
SE-275 board

### 4. Operation check

Check to see that the detection pins move freely in the vertical direction and return to the original position.

## 3-10-24. Tension Regulator Arm Assembly Replacement

---

### Overviews

#### Replacement

Brake band removal
Tension regulator arm assembly removal
Tension regulator arm assembly installation
Brake band installation
Tension regulator (S4) guide cleaning

#### Checks after replacement

Tension regulator operating position check
FWD back tension check
Tape running check

---

### Note

- A new stop washer is required for replacing the tension regulator arm assembly. When replacing the assembly, use a new stop washer.
  Stop washer : 3-559-408-11 (one piece)

---

### Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

---

### Tools

| | |
|---|---|
| • FWD back tension measurement cassette tape : | J-6323-890-A |
| • Stop washer fastening tool : | J-6323-530-A |
| • Cleaning cloth : | 3-184-527-01 |
| • Cleaning fluid : | 9-919-573-01 |

## Removal

### 1. Brake band removal

(1) Remove the stop washer on the tension regulator arm using a pair of tweezers (or equivalent).

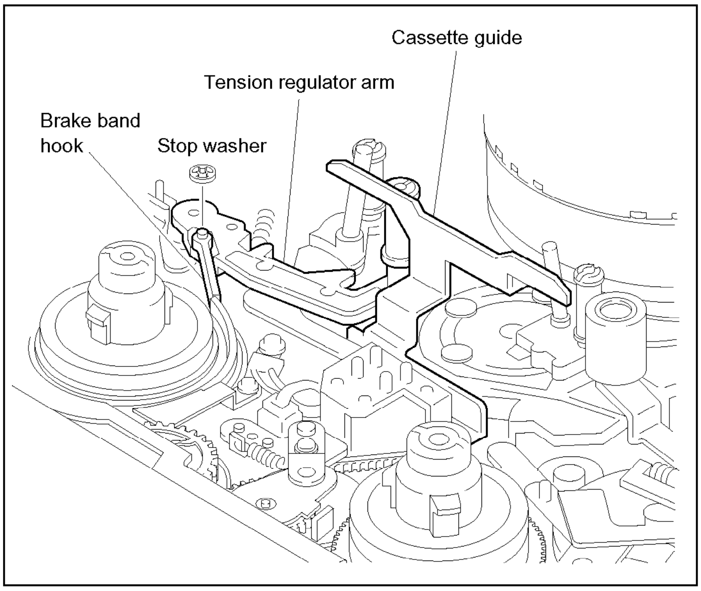
**Note**

When removing, do not apply excessive force to the tension regulator arm.

(2) Remove the hook of the brake band from the shaft of the tension regulator arm.

**Note**

Do not bend the brake band. Do not apply oil onto the felt surface.


Cassette guide
Tension regulator arm
Brake band hook
Stop washer

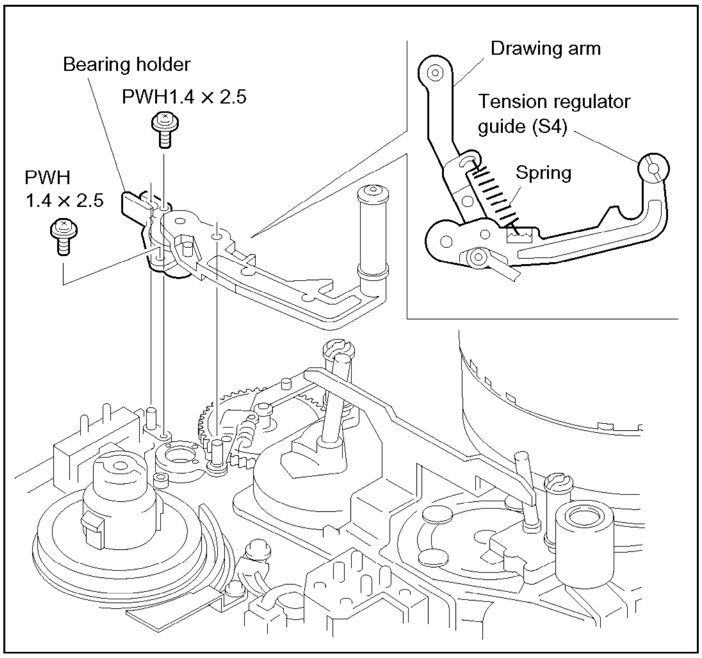
### 2. Tension regulator arm assembly removal

(1) Remove the hook of the spring at the tension regulator arm side shown in the figure.

**Note**

Note the hooked position of the spring at the drawing arm side and tension regulator arm side.

(2) Remove the two screws of the bearing holder and the tension regulator arm assembly.


Bearing holder
PWH1.4 × 2.5
PWH 1.4 × 2.5
Drawing arm
Tension regulator guide (S4)
Spring

## Installation

### 3. Tension regulator arm assembly installation

(1) Attach the tension regulator arm assembly using the two screws.
(2) Re-hook the removed spring in the step 2 (1) at its original positions.

### 4. Brake band installation

(1) Insert the shaft of the tension regulator arm into the hook of the brake band.
(2) Attach the stop washer while supporting the arm with the finger.

**Note**

When attaching, do not apply excessive force to the tension regulator arm.

### 5. Tension regulator (S4) guide cleaning

Clean the tension regulator (S4) guide using a cleaning cloth moistened with cleaning fluid. (Refer to Section 6-1-5 of the maintenance manual part 1.)
After cleaning, be sure to wipe with a dry cleaning cloth.

## Checks after replacement

### 6. Tension regulator operating position check

(Refer to Section 4-1-1.)

### 7. FWD back tension check

(Refer to Section 4-1-2.)

### 8. Tape running check

(Refer to Section 4-2-2.)

## 3-10-25. Replacement of the Component Parts of the Threading Link Block

### Overviews

### Replacement

Cassette guide removal
Video head cleaner assembly removal
Drum assembly removal
Band holder removal
Tension regulator arm assembly removal
Pinch assembly removal
Drawing arm removal
Driving gear removal
Catcher S removal
Threading link assembly removal
Slider removal
Threading gear assembly removal
Threading gear assembly installation
Slider installation
Threading link assembly installation
Catcher S installation
Driving gear installation
Drawing arm installation
Pinch arm assembly installation
Tension regulator arm assembly installation
Band holder installation
Drum assembly installation
Video head cleaner assembly installation
Cassette guide installation
Cleaning of the head and the tape running surface

### Checks after replacement

Tension regulator operating position check
FWD back tension check
Tape running check

## Notes

- New E rings are required for attaching the S slider and T slider. Use new E rings when replacing these parts.
  E ring 1.2 : 7-624-101-04 (Use one piece E ring for each)
- New stop washers are required for attaching the pinch arm assembly, and drive gear. Use new stop washers when replacing these parts.
  Stop washer : 3-559-408-11 (Use six pieces)

## Preparations

1. Verify that the unit is in the unthreading end mode.
2. Turn the power off.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
4. Remove the cassette compartment.
   (Refer to Section 2-6 of the maintenance manual part 1.)

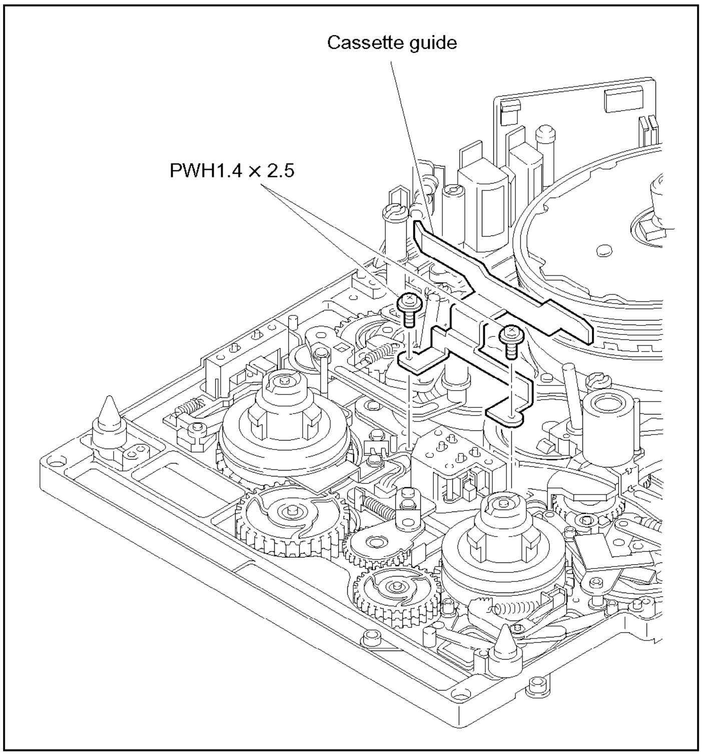
## Tools

- FWD back tension measurement cassette tape : J-6323-890-A
- Stop washer fastening tool : J-6323-530-A
- Cleaning cloth : 3-184-527-01
- Cleaning fluid : 9-919-573-01

## Removal

### 1. Cassette guide removal

Remove the two screws and cassette guide.



### 2. Video head cleaner assembly removal

Remove the video head cleaner assembly.
(Refer to Section 3-10-10.)

### 3. Drum assembly removal

Remove the drum assembly.
(Refer to Section 3-10-8.)

### 4. Band holder removal

Using the torque screwdriver bit (for M1.4) remove the screw and the band stopper.
(Refer to Section 3-10-12.)

## 5. Tension regulator arm assembly removal

Remove the tension regulator arm assembly.
(Refer to Section 3-10-24.)

## 6. Pinch arm assembly removal

Remove the pinch arm assembly.
(Refer to Section 3-10-21.)

## 7. Drawing arm removal

Remove the stop washer and the drawing arm.

## 8. Driving gear removal

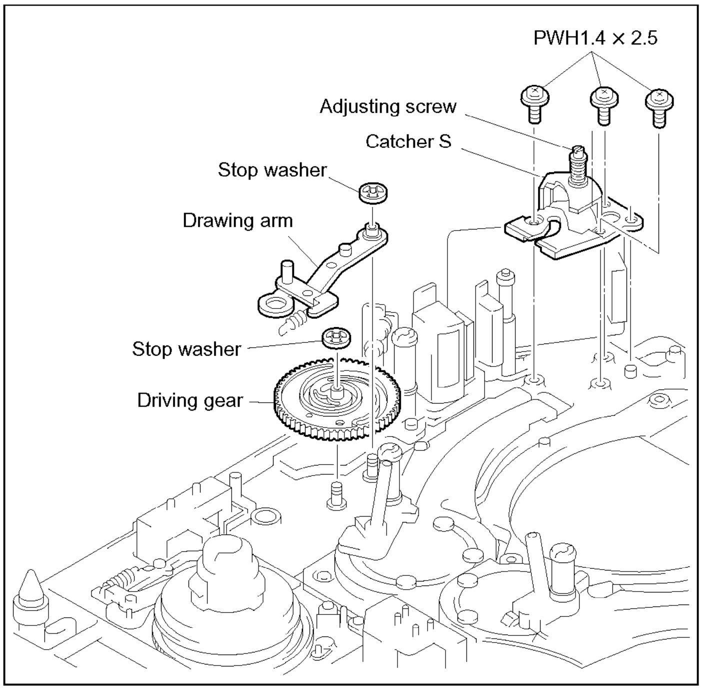
Remove the stop washer and the driving gear.

## 9. Catcher S removal

Remove the three screws and the catcher S.

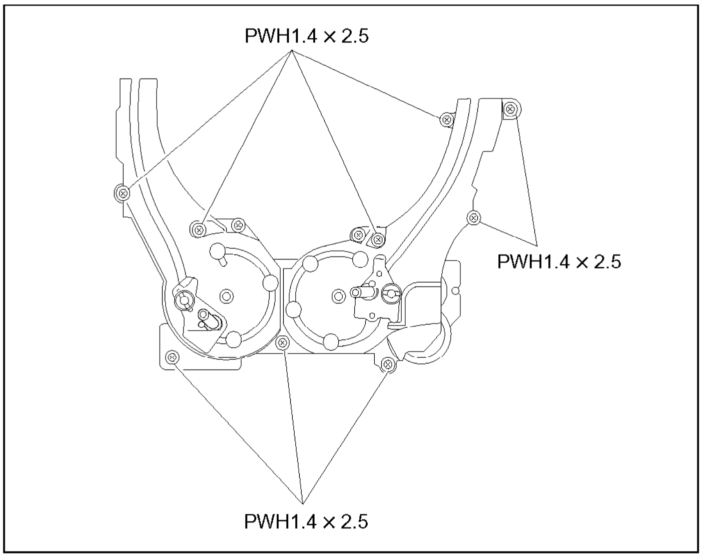
**Note**

Never turn and remove the adjusting screw of the catcher S.


PWH1.4 × 2.5
Adjusting screw
Catcher S
Stop washer
Drawing arm
Stop washer
Driving gear

### 10. Threading link assembly removal

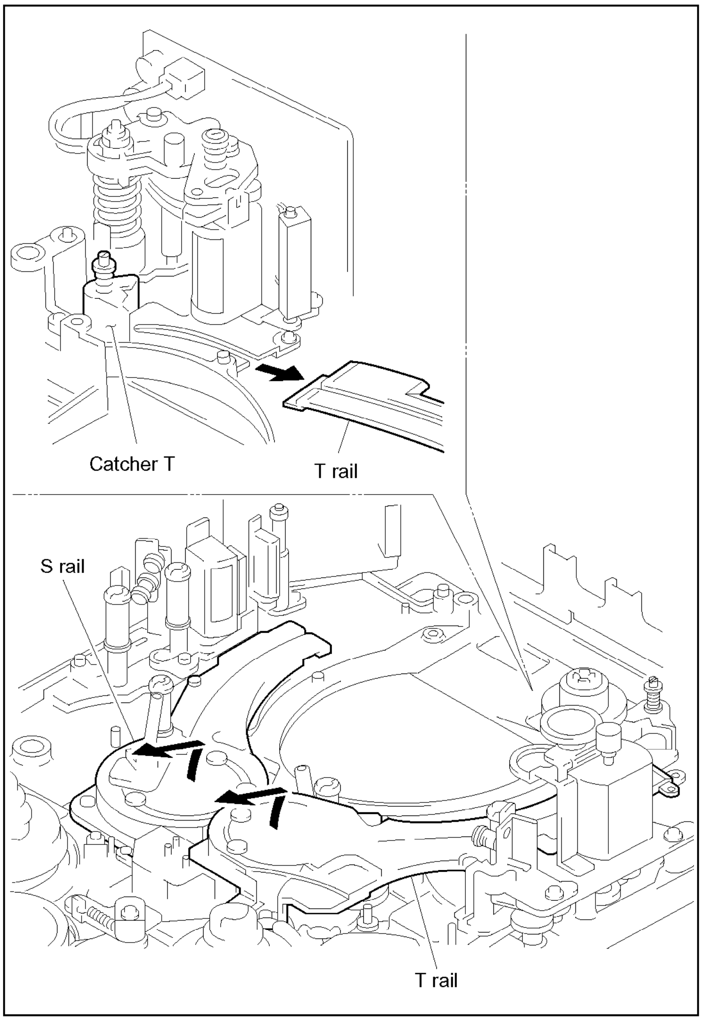
(1) Remove the nine screws shown in the figure.


PWH1.4 × 2.5
PWH1.4 × 2.5
PWH1.4 × 2.5

(2) Because the tip of the T rail is under the catcher T, tilt the threading link assembly as shown in the figure when removing it.

**Note**

Do not touch the rail against the stationary heads.


Catcher T
T rail
S rail
T rail

### 11. Slider removal

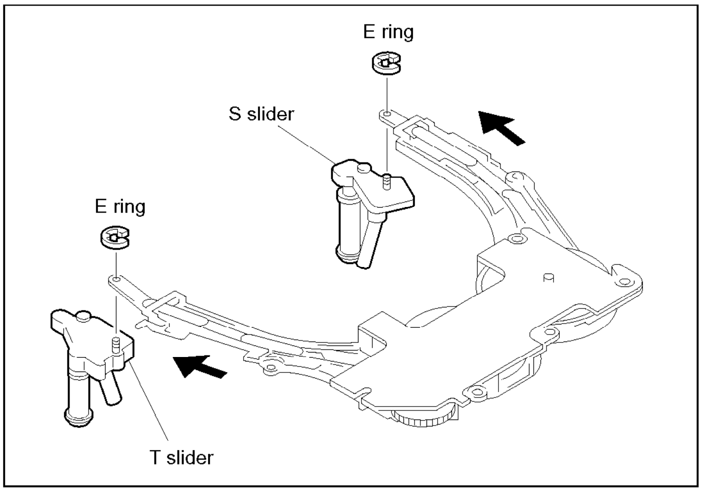
(The procedures for removing the S side slider are the same as those for removing the T side.)

(1) Pull out the slider and remove the E ring from the back.

(2) Pull out the slider from the end of the rail.

**Note**

Handle the removed slider with care. Do not scratch and deform the guides and roller block.

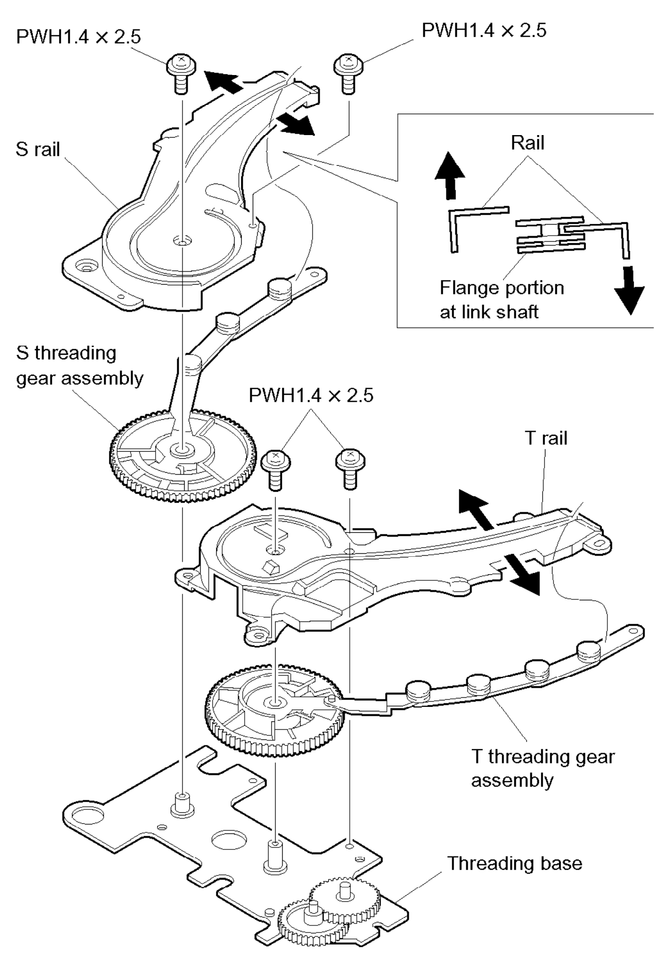


## 12. Threading gear assembly removal

(The procedures for removing the S side threading gear are the same as those for removing the T side.)

(1) Remove the flange portion at the link shaft of the threading gear assembly while opening the rail.

(2) Remove the two screws, the rail and threading gear assembly from the threading base.


PWH1.4 × 2.5
PWH1.4 × 2.5
S rail
Rail
Flange portion
at link shaft
S threading
gear assembly
PWH1.4 × 2.5
T rail
T threading gear
assembly
Threading base

## Installation

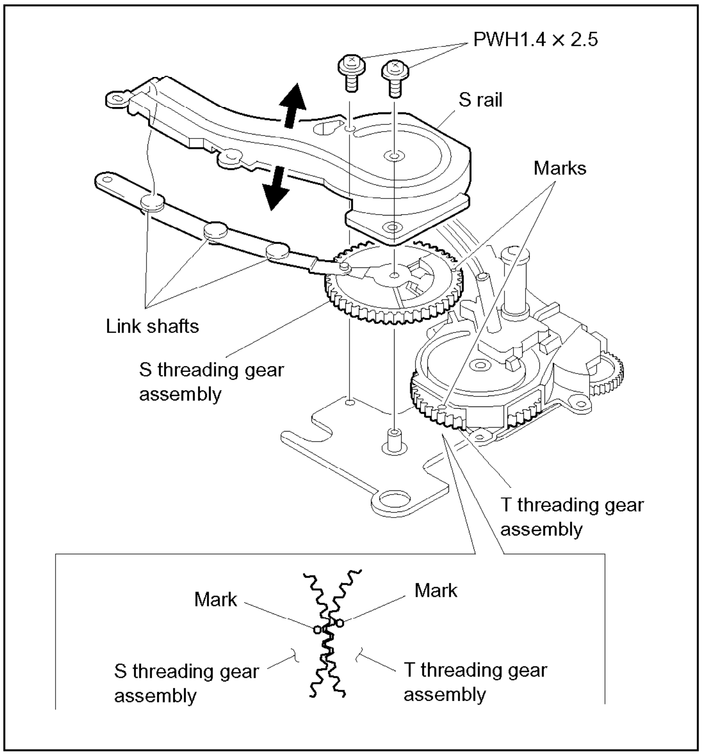
### 13. Threading gear assembly installation

S threading gear assembly installation

(1) Attach the S threading gear assembly to the threading base while aligning the mark of the S threading gear as shown in the figure.

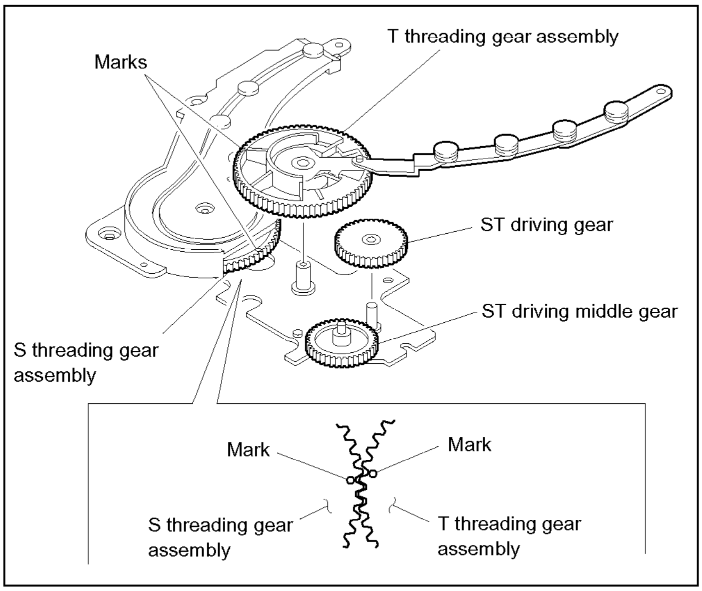
(2) Attach the rail using the two screws.

(3) Pass the flange portion at the link shaft of the S threading gear assembly through the rail while opening the groove of the rail.


PWH1.4 × 2.5
S rail
Marks
Link shafts
S threading gear assembly
T threading gear assembly
Mark
Mark
S threading gear assembly
T threading gear assembly

T threading gear assembly installation

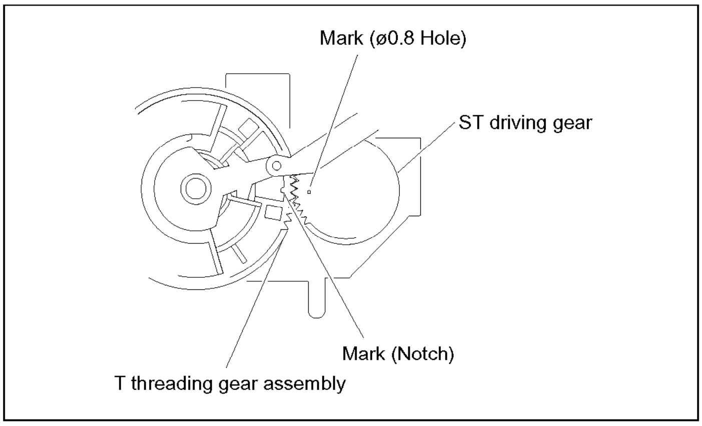
(1) Attach the T threading gear assembly to the threading base while aligning the mark of the T threading gear as shown in the figure.


Marks
T threading gear assembly
ST driving gear
ST driving middle gear
S threading gear assembly
Mark
Mark
S threading gear assembly
T threading gear assembly

(2) Align the mark (notch) of the T threading gear with the mark (hole) of the ST driving gear as shown in the figure.

(3) Attach the rail using the two screws.

(4) Pass the flange portion at the link shaft of the T threading gear assembly through the rail while opening the groove of the rail.

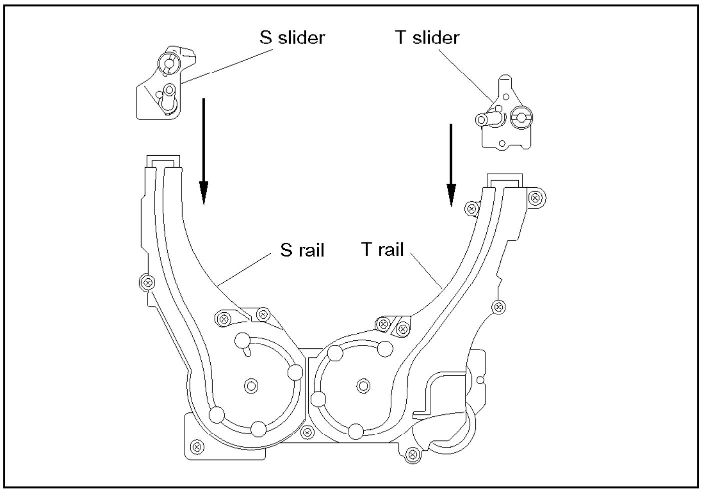

Mark (ø0.8 Hole)
ST driving gear
Mark (Notch)
T threading gear assembly

## 14. Slider installation

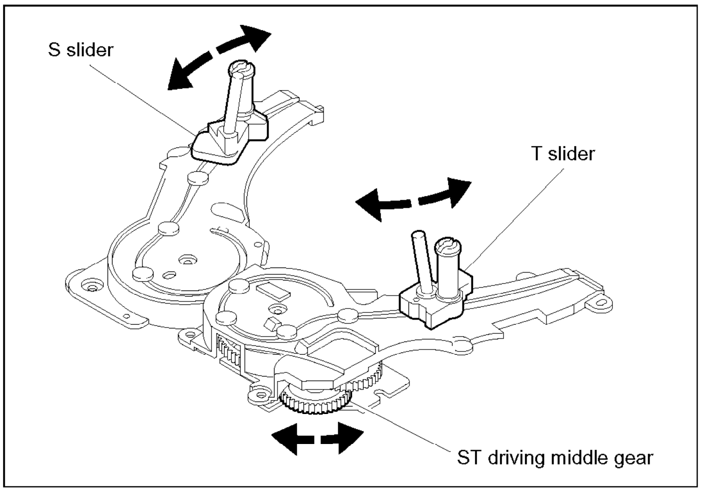
(The procedures for attaching the S slider are the same as those for attaching the T side.)

(1) Pass the slider through the rail in the direction of the arrow.

(2) Insert the installing shaft of the slider in the installing hole of the link using the new E ring.


S slider
T slider
S rail
T rail

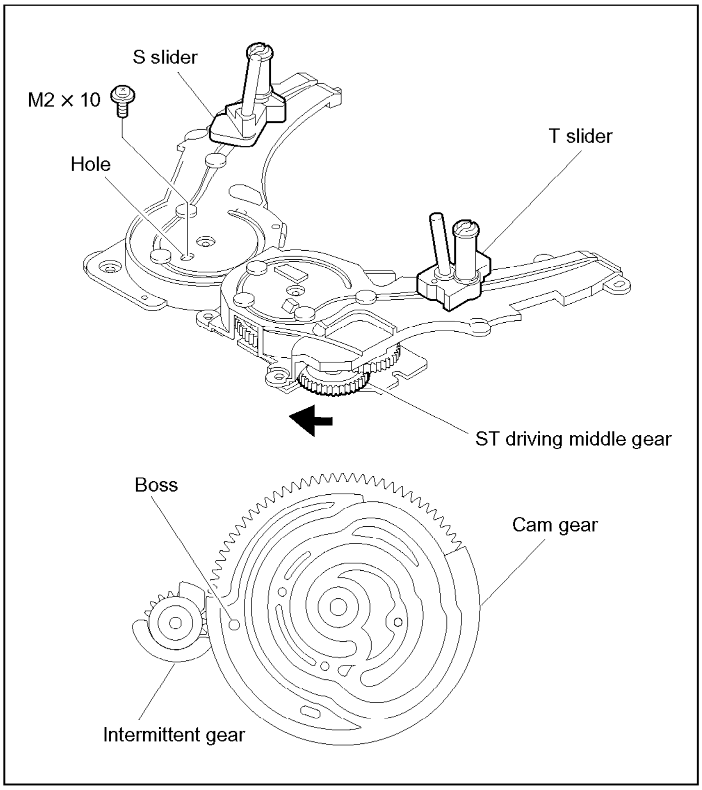
(3) Turn the ST driving middle gear using fingers and check to see that the slider moves smoothly.


S slider
T slider
ST driving middle gear

## 15. Threading link assembly installation

(1) Turn the ST driving middle gear clockwise to return the slider, and insert the screw (M2 × 10) in the hole shown in the figure.

(2) Turn the manual eject knob clockwise so that the cam gear comes to the position shown in the figure.


S slider
M2 × 10
Hole
T slider
ST driving middle gear
Boss
Cam gear
Intermittent gear

(3) Insert the tip of the T rail under the catcher T.

(4) Align the boss (A) and the hole, and the notch (B) and the boss as shown in the figure. Attach the threading link assembly to the mechanical chassis.

(5) If the ST driving middle gear does not engage with the intermittent gear, turn the manual eject knob clockwise till they engage.

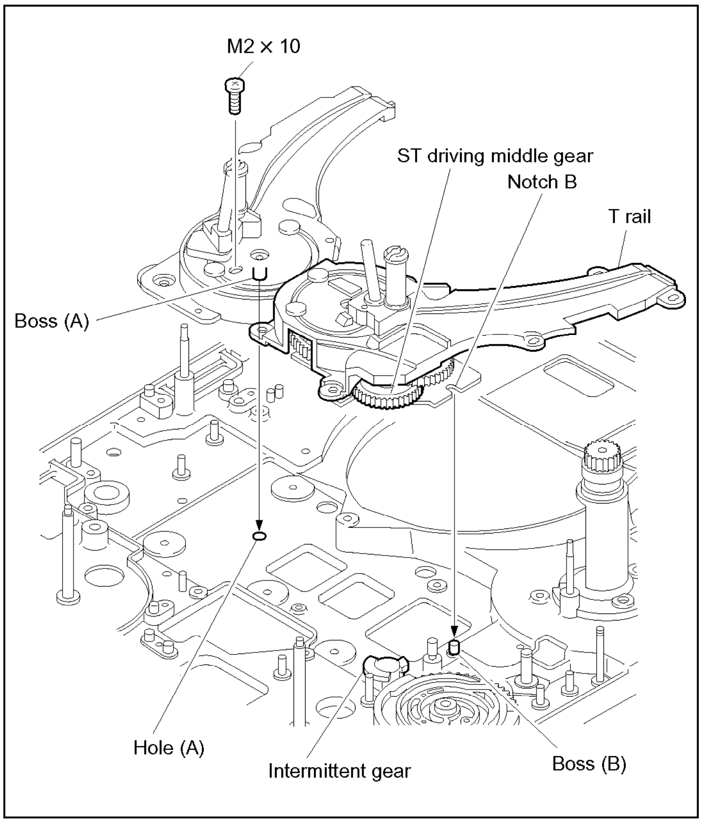
(6) Tighten the nine screws.

**Note**

Do not scratch the stationary heads by the driver.

(7) Remove the screw (M2 × 10) attached in step 16 (1) from the threading link assembly.

(8) If the intermittent gear is turned in step (5), turn the manual eject knob counterclockwise and return the cam gear to the position in step (2).


M2 × 10
ST driving middle gear
Notch B
T rail
Boss (A)
Hole (A)
Intermittent gear
Boss (B)

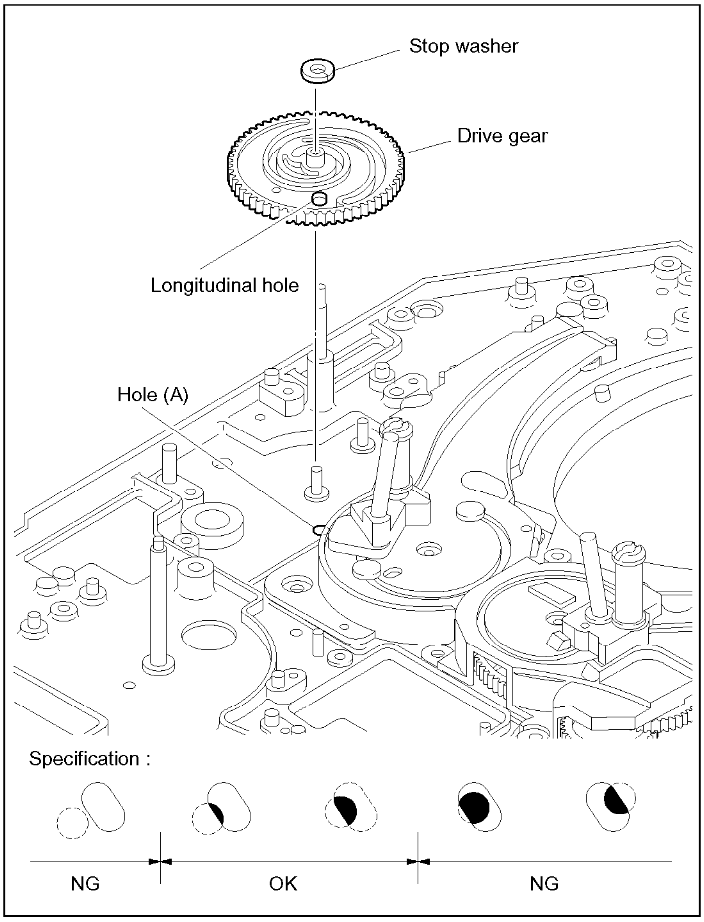
## 16. Catcher S installation

Attach the catcher S using the three screws.

## 17. Driving gear installation

(1) Install the drive gear so that the positional relationship between the longitudinal hole of the drive gear and the hole (A) on the mechanical chassis meets the specification. (Refer to right figure.)

(2) Attach the drive gear using the new stop washer.


Stop washer
Drive gear
Longitudinal hole
Hole (A)
Specification :
NG
OK
NG

## 18. Drawing arm installation

Insert the installing shaft into the drawing arm and attach it using the stop washer.

## 19. Pinch arm assembly installation

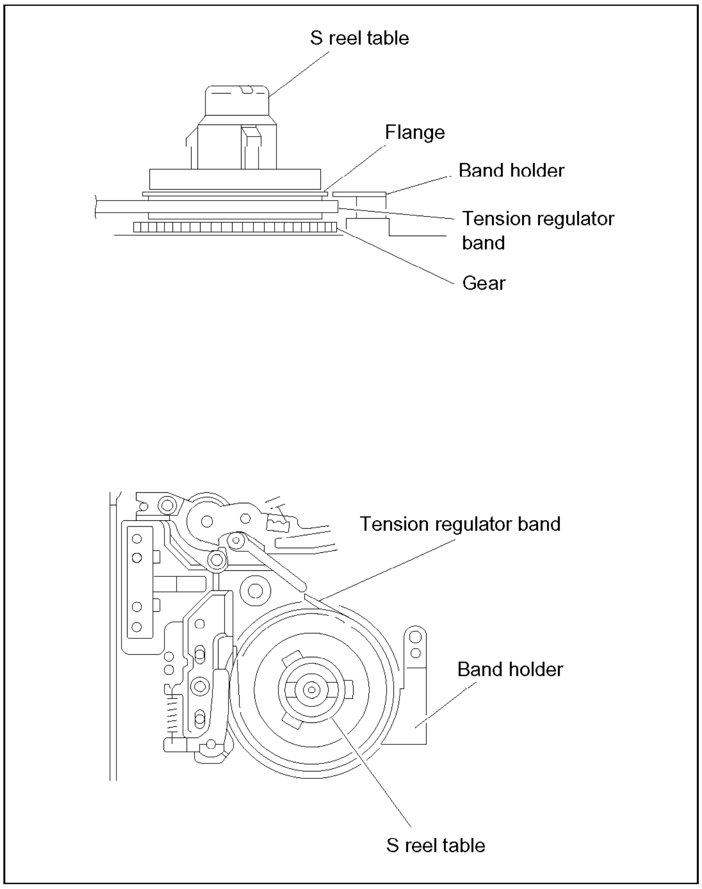
Attach the pinch arm assembly.
(Refer to Section 3-10-21.)

## 20. Tension regulator arm assembly installation

Attach the tension regulator arm assembly.
(Refer to Section 3-10-24.)

## 21. Band holder installation

Attach the band stopper using the screw.


S reel table
Flange
Band holder
Tension regulator band
Gear
Tension regulator band
Band holder
S reel table

## 22. Drum assembly installation

Install the drum assembly.
(Refer to Section 3-10-8.)

### 23. Video head cleaner assembly installation

Install the video head cleaner assembly.
(Refer to Section 3-10-10.)

### 24. Cassette guide installation

Attach the cassette guide using the two screws.
(Refer to step 1.)

### 25. Cleaning of the head and the tape running surface

Clean the following areas using a cleaning cloth moistened with cleaning fluid.
(Refer to Section 6 of the maintenance manual part 1.)

- Video heads
- Tape running surface of the upper drum
- Tape running surface and lead of the lower drum
- All tape guides and pinch rollers

After cleaning, be sure to wipe the relevant areas using a dry cleaning cloth.

---

## Checks after replacement

### 26. Tension regulator operating position check

(Refer to Section 4-1-1.)

### 27. FWD back tension check

(Refer to Section 4-1-2.)

### 28. Tape running check

(Refer to Section 4-2-2.)

# Section 4
# Alignment after Replacement of Parts

## 4-1. Mechanical Adjustment

### 4-1-1. Tension Regulator Operating Position Adjustment

---

**Note**

When replacing the brake band assembly, tension regulator arm assembly, threading link component, or S reel table assembly, be sure to carry out the tension regulator operating position adjustment.

---

**Preparations**

1. Set the format to 23.98 PsF in MULTI FORMAT page of the MAINTENANCE menu. (Refer to Section 4-5 of the maintenance manual part 1.)
2. Verify that the unit is in the unthreading end mode.
3. Turn the power off.
4. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)
5. Remove the cassette compartment.
   (Refer to Section 2-6 of the maintenance manual part 1.)

**Reference**

The tension regulator operating position can be checked if it has been adjusted correctly even with the cassette compartment attached to the unit.

---

**Tools**

| | |
|---|---|
| • Torque screwdriver bit (for M2) : | J-6325-380-A |
| • Torque screwdriver (for 3 kg) : | J-6325-400-A |

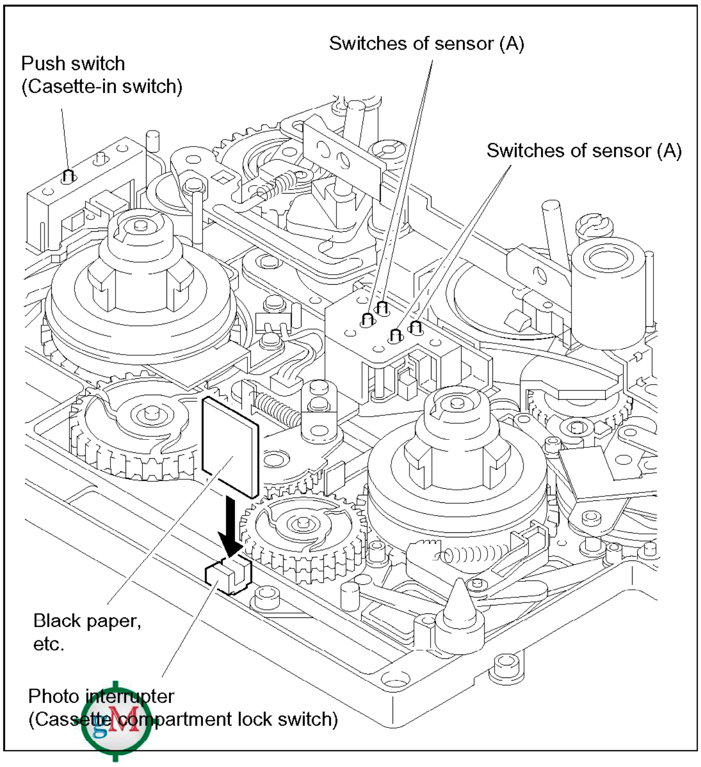
## Check

### 1. Mode selection

(1) Turn the power on.

(2) As shown in the figure, cover the photo interrupter (cassette compartment lock switch) mounted on the SE-275 board with a black paper, etc.

(3) While pressing the four switches of sensor A, press the push switch (cassette-in switch) mounted on the SE-275 board with the finger for about one second.
This will set the unit into the threading end mode without a cassette tape.


Switches of sensor (A)
Push switch
(Casette-in switch)
Switches of sensor (A)
Black paper,
etc.
Photo interrupter
(Cassette compartment lock switch)

## 2. Tension regulator operating position check

Check to see that the position of the boss on the tension regulator shown in the figure meets the specification.

Specification:
The external circumference of the boss should be 1 mm away from the extension line of the edge portion of the tape end sensor bracket of the tape end sensor bracket.

If the specification is not satisfied, check to see that the position of the boss shifts in either direction A or B against the extension line of the edge portion of the tape end sensor bracket. After checking, carry out step 3.

## Adjustment

### 3. Position adjustment

(1) Loosen the screw of the band base by about 1/3 of a turn.

(2) Insert the 3 mm flatblade screwdriver in the notch shown in the figure and adjust the position of the band base so that it meets the specification.

### Note on adjustment

- If the tension regulator shifts in direction A, turn the flatblade screwdriver clockwise.
- If the tension regulator shifts in direction B, turn the flatblade screwdriver counterclockwise.

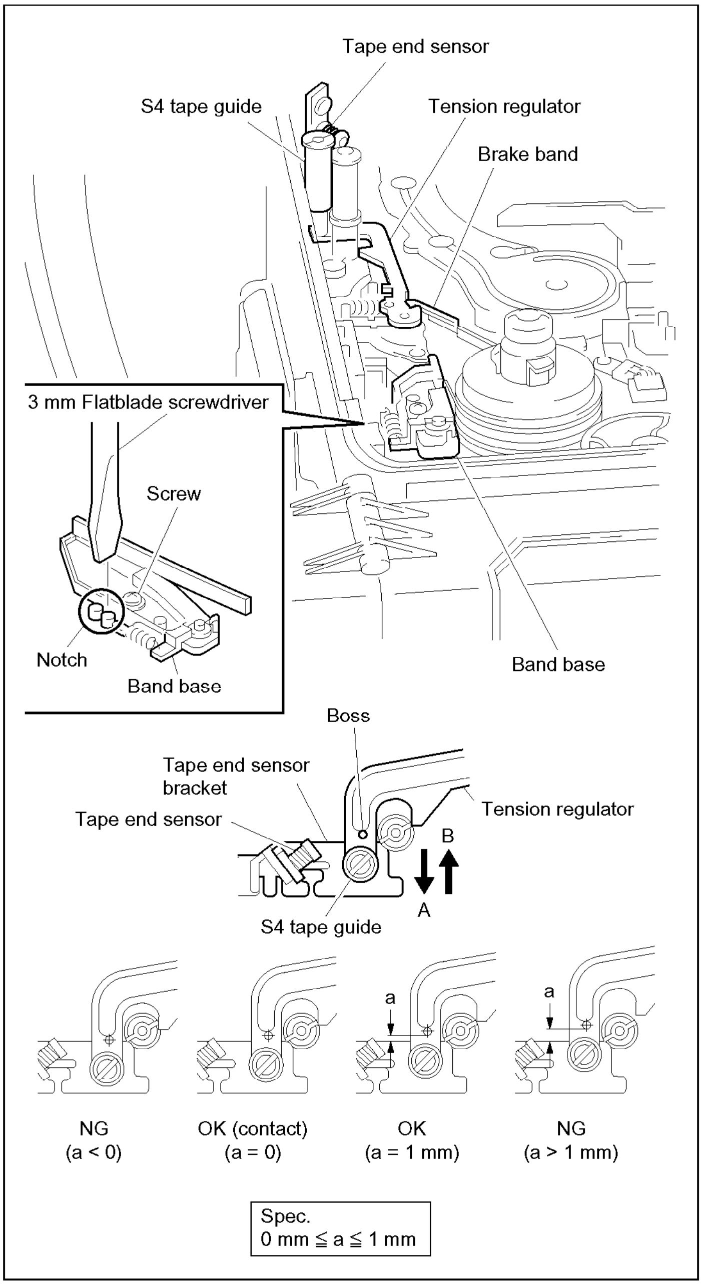
(3) While keeping the state of step (2), tighten the screw of the band base.

### 4. Mode cancel

Press the EJECT button and set the unit into the unthreading end mode.

### 5. FWD back tension adjustment

Carry out the FWD back tension adjustment.
(Refer to Section 4-1-2.)


Tape end sensor
S4 tape guide
Tension regulator
Brake band
3 mm Flatblade screwdriver
Screw
Notch
Band base
Band base
Boss
Tape end sensor bracket
Tape end sensor
Tension regulator
B
A
S4 tape guide
a
a
NG
(a < 0)
OK (contact)
(a = 0)
OK
(a = 1 mm)
NG
(a > 1 mm)
Spec.
0 mm ≦ a ≦ 1 mm

## 4-1-2. FWD Back Tension Adjustment

### Note

When replacing the brake band assembly, tension regulator arm assembly, threading link component, or S reel table assembly, or adjusting the tension regulator operating position, be sure to adjust the FWD back tension.

### Preparations

1. Set the format to 23.98 PsF in MULTI FORMAT page of the MAINTENANCE menu. (Refer to Section 4-5 of the maintenance manual part 1.)
2. Verify that the unit is in the unthreading end mode.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

**Note**

If the cassette compartment is not attached to the unit, cover the photo interrupter (cassette compartment lock switch) mounted on the SE-275 board with a black paper, etc. so that the cassette compartment is locked.
Also place a weight on the FWD back tension measuring cassette to prevent it from rising before carrying out this adjustment.

### Tool

- FWD back tension measuring cassette tape : J-6323-890-A

  **Note**

  It is necessary to perform the modification for using the HDCAM.
  (Refer to Section 1-13-3.)

## Check

### 1. REC mode setting

Load a FWD back tension measuring cassette tape, and set it in the recording mode.

### 2. FWD back tension check

Check to see that the value of the FWD back tension measuring cassette tape at the S side meets the specification.

Specification: $52^{+10}_{-5} \times 10^{-4}$ N•m ($52^{+10}_{-5}$ gf•cm)

If the specification is not met, carry out from step 3 onwards after checking if the value is larger or smaller than the specification.

## Adjustment

### 3. EJECT mode setting

Eject the FWD back tension measuring cassette tape.

### 4. Back tension adjustment

Change the position of the spring on the tension regulator arm block.

### Note on of adjustment

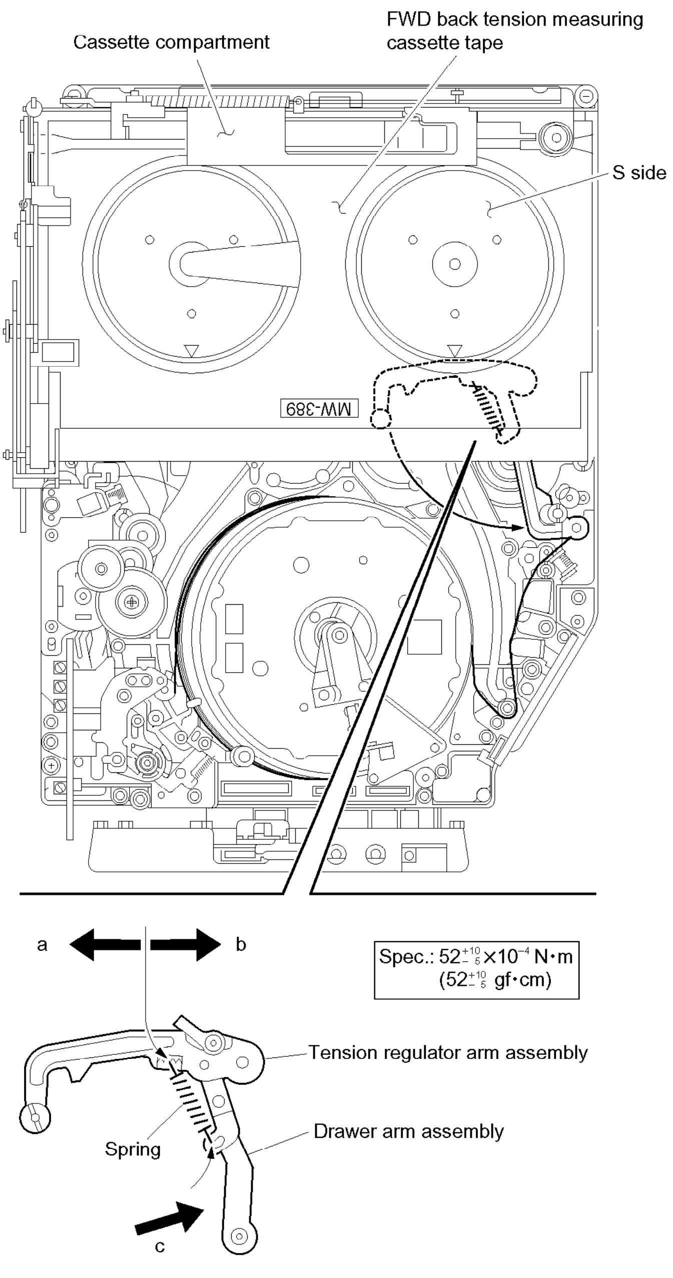
- If the value is larger than the specification, move the spring in direction b.
- If the value is smaller than the specification, move the spring in direction a.

### 5. FWD back tension check after adjustment

Carry out steps 1 and 2 and check to see that the value meets the specification.

**Note**

If the value does not meet the specification after carrying out step 4, move the spring at the drawer arm assembly side in direction c. Carry out step 4 again and re-adjust.


Cassette compartment
FWD back tension measuring cassette tape
S side
a
b
Spec.: $52^{+10}_{-5} \times 10^{-4}$ N•m
($52^{+10}_{-5}$ gf•cm)
Tension regulator arm assembly
Drawer arm assembly
Spring
c

## 4-1-3. Brake Torque Check

---

### Note

When replacing the T soft brake assembly or T reel table assembly, be sure to carry out brake torque check.

---

### Preparations

1. Set the format to 23.98 PsF in MULTI FORMAT page of the MAINTENANCE menu. (Refer to Section 4-5 of the maintenance manual part 1.)
2. Verify that the unit is in the unthreading end mode.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

---

### Tool

- FWD back tension measuring cassette tape : J-6323-890-A

  **Note**

  It is necessary to perform the modification for using the HDCAM.
  (Refer to Section 1-13-3.)

## Check

### 1. Setting

(1) Load the FWD back tension measuring cassette tape.

(2) Set the dip switch S1-1 on the HN-243 board to ON. The red LED will light up.

(3) Press switch S3 on the HN-243 board 10 times. After pressing, make sure that MODE display LEDs 1 and 3 are lit.

(4) Press the REW button to set the unit into the REV × 1 mode.

### 2. T side brake torque check

Check to see that the value of the FWD back tension measuring cassette tape at the T side meets the specification.

Specification: $40 \pm 10 \times 10^{-4}$ N•m (40 ±10 gf•cm)

**If the value does not meet the specification ;**

- Make sure that the T soft brake assembly is attached properly to the unit according to Section 3-10-15.

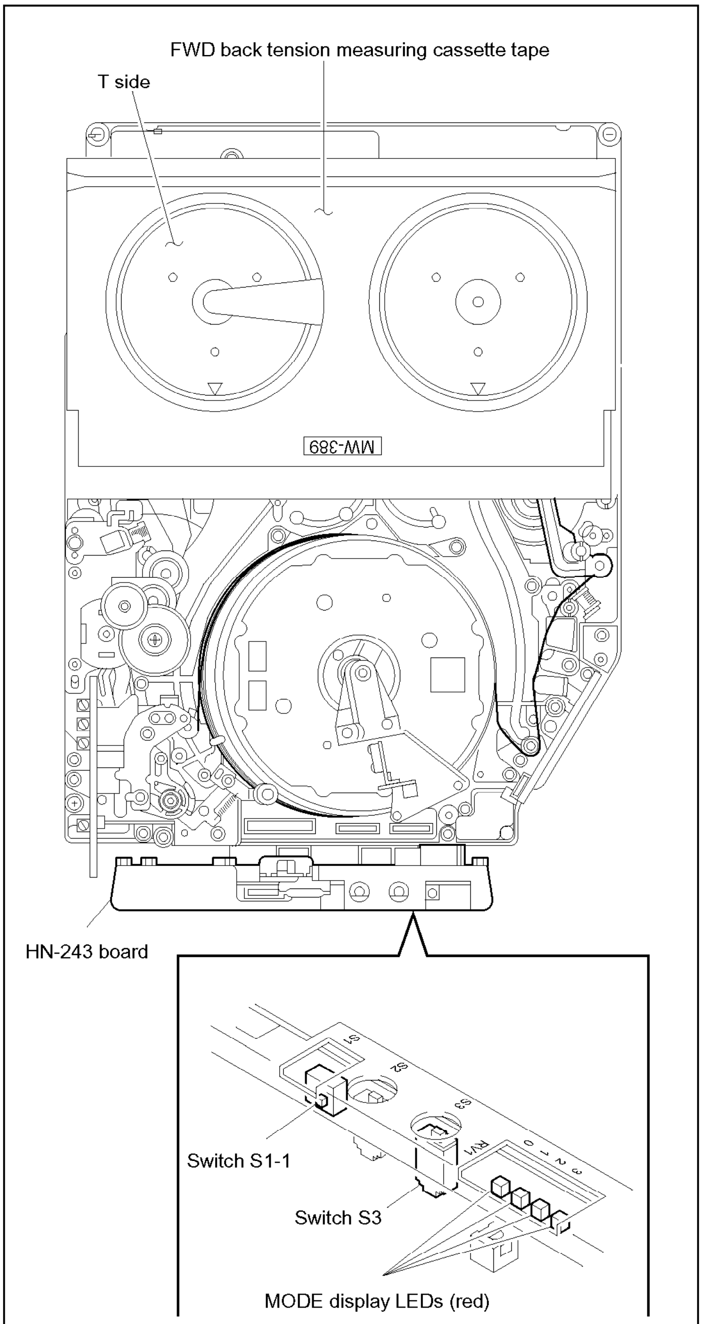
Or

- Replace the T soft brake assembly according to Section 3-10-15.

### 3. Mode cancel

(1) Set the unit into the STOP mode.

(2) Set the dip switch S1-1 on the HN-243 board to OFF. Make sure that the red LED lit at step 1 (2) goes off.


FWD back tension measuring cassette tape
T side
MW-389
HN-243 board
S1
S2
S3
Switch S1-1
Switch S3
MODE display LEDs (red)

Spec. : $40 \pm 10 \times 10^{-4}$ N•m
(40 ±10 gf•cm)

## 4-1-4. Belt Tension Adjustment

### Note

When replacing the swing gear assembly, capstan motor, or timing belt, be sure to adjust the belt tension.

### Preparations

1. Set the format to 23.98 PsF in MULTI FORMAT page of the MAINTENANCE menu. (Refer to Section 4-5 of the maintenance manual part 1.)
2. Verify that the unit is in the unthreading end mode.
3. Remove the front lid and outside panel.
   (Refer to Section 2-4 of the maintenance manual part 1.)

### Tools

| | |
|---|---|
| • Torque screwdriver bit (for M1.4) : | J-6325-110-A |
| • Torque screwdriver (for 3 kg) : | J-6325-400-A |

### Adjustment

#### 1. Belt tension adjustment

(1) Make sure that the tension spring and its hook shown in the figure of the swing gear assembly are not deformed.

**Note**

The belt tension is automatically adjusted by this tension coil spring.
If the spring or hook is deformed, replace it before beginning the adjustment. (Refer to Section 3-10-15.)

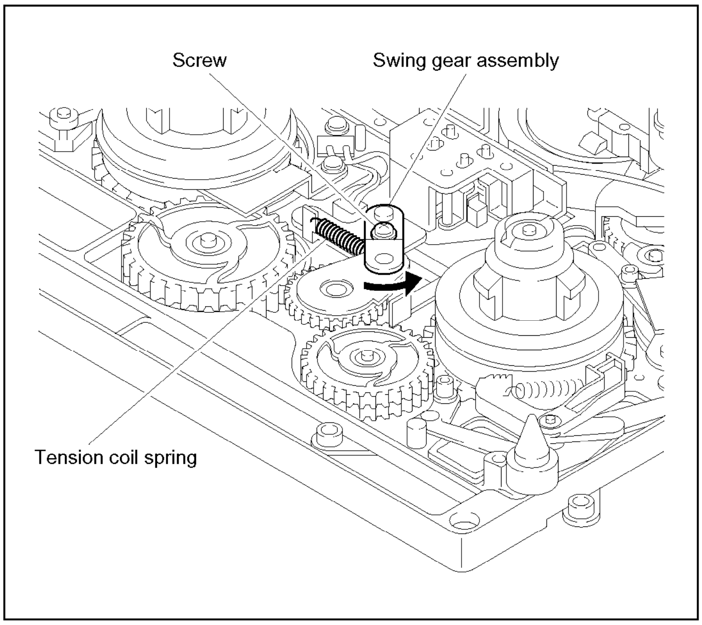
(2) Loosen the screw shown in the figure by one or two turns.

(3) Press the swing gear arm in the direction of the arrow with the finger and release. The swing gear arm will automatically return to the correct position by the force of the spring.

(4) Tighten the screw loosened in step (2).

**Note**

When tightening the screw, never hold the swing gear assembly block with the finger.

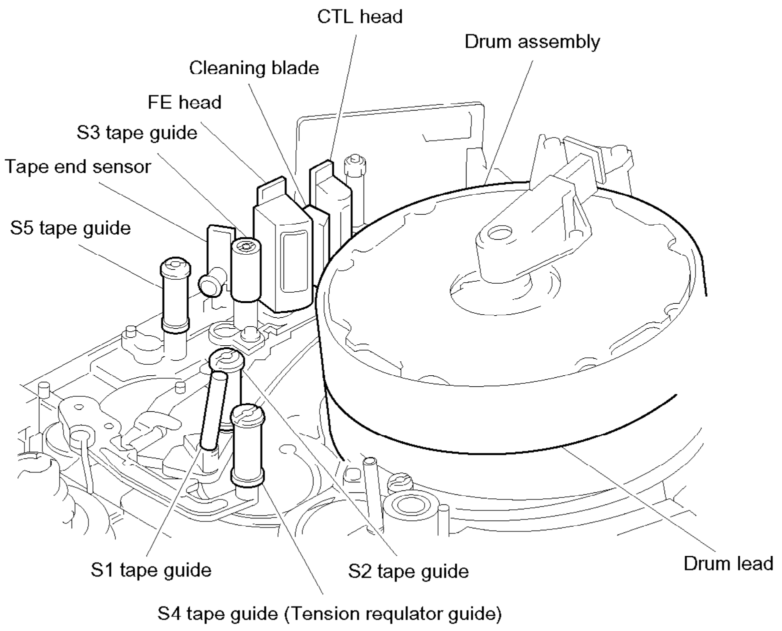


# 4-2. Tape Path Adjustment

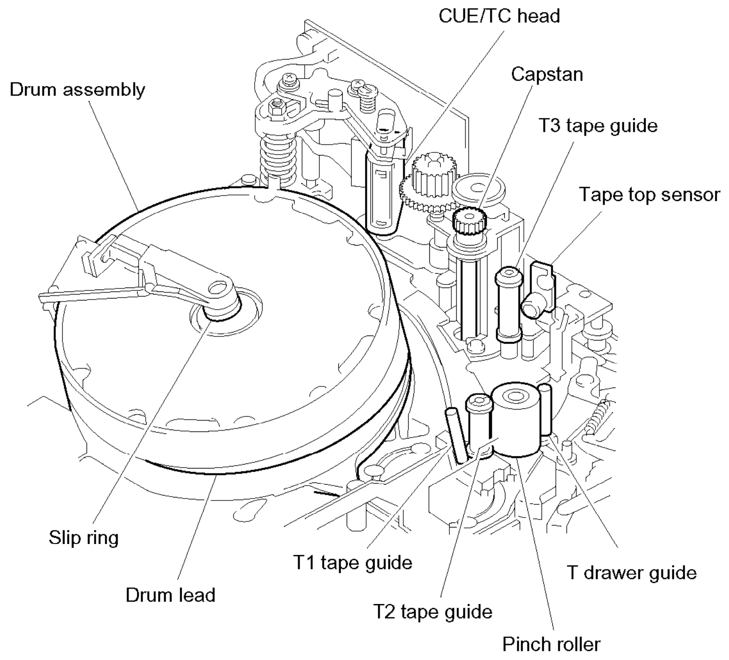
## 4-2-1. Preparations and General Information

### 1. Location of Tape Path System

Drum entrance side (Unthreading end mode)


CTL head
Drum assembly
Cleaning blade
FE head
S3 tape guide
Tape end sensor
S5 tape guide
S1 tape guide
S2 tape guide
Drum lead
S4 tape guide (Tension requlator guide)

Drum exit side (Unthreading end mode)


CUE/TC head
Capstan
Drum assembly
T3 tape guide
Tape top sensor
Slip ring
T1 tape guide
T drawer guide
Drum lead
T2 tape guide
Pinch roller

## 2. Note

- About cassette compartment
  Carry out the tape path adjustment with the cassette compartment attached to the unit.

## 3. Preparations

(1) Set the format to 23.98 PsF in MULTI FORMAT page of the MAINTENANCE menu.
(Refer to Section 4-5 of the maintenance manual part 1.)

(2) Turn the power off.

(3) Remove the front lid and outside panel. (Refer to Section 2-4 of the maintenance manual part 1.)

(4) Clean the following parts using a cleaning cloth moistened with cleaning fluid.
(Refer to Section 6-1 of the maintenance manual part 1.)

- Video heads
- Tape running surface of the upper drum
- Tape running surface of the lower drum and lead surface
- Stationary heads
- Tape cleaner
- All tape guides
- Capstan shaft
- Pinch roller

## 4. Tools

| | |
|---|---|
| • Tape guide adjustment screwdriver : | J-6321-500-A |
| • TP tool : | J-6510-070-A |
| • Inspection mirror (small oval) : | J-6080-840-A |
| • Cleaning cloth : | 3-184-527-01 |
| • Cleaning fluid : | 9-919-573-01 |
| • Alignment tape, HR2-1A : | 8-960-076-11 |

### Contents

| Time min. : sec. | CTL Track | CUE Track | Video/Audio Track | Use |
|---|---|---|---|---|
| 00 : 00<br>↑<br>(CTL Pulse)<br>↓ | CTL | 1 kHz 0 VU | 5.875 MHz<br>(A ch only) | • Video tracking adjustment<br>• CTL head position adjustment<br>• CUE head height adjustment<br>• CUE/TC head position adjustment |
| 15 : 00 | | 12 kHz 0 VU | A, C ch – 5.875 MHz | • CUE/TC head azimuth adjustment<br>• CUE/TC head head-to-tape contact adjustment |
| 20 : 00 | | | A, C ch<br>First half : 5.875 MHz<br>Latter half : 23.5 MHz<br>B, D ch<br>First half : 23.5 MHz<br>Latter half : 5.875 MHz | |
| 25 : 00 | | | 23.5 MHz<br>(All ch) | |
| 30 : 00 | | | | |

* The CTL head height adjustment can be performed using any portion of the alignment tape.

## 4-2-2. Tape Running Adjustment

### Notes

- When carrying out the tape running adjustment after replacing the parts of the tape path system, first carry out tape running checks and adjustments using the commercially available cassette tape BCT-40HD before using the alignment tape.
  Next carry out tape running checks and fine adjustments using the alignment tape HR2-1A.
- The following checks and adjustments are performed using the alignment tape unless specified otherwise.
- Tighten the screws at the top of the tape guides at the following tightening torque.
  $9 \times 10^{-2}$ N•m (0.9 kgf•cm)
- After the adjustments, be sure to check video tracking, and then apply locking compound to the screws at the top of each tape guide.

### Tools

| | |
|---|---|
| • Tape guide adjustment screwdriver (45) : | J-6322-420-A |
| • Inspection mirror (small oval) : | J-6080-840-A |
| • Alignment tape, HR2-1A : | 8-960-076-11 |
| • Cassette tape, BCT-40HD : | Standard products |

## Drum Entrance Side

### Checks

#### 1. PLAY mode (Beginning portion of the tape)

Set the beginning portion of the HR2-1A tape (from 5:00 to 10:00) into the PLAY mode. Check to see that the tape running meets specification 1. If it does not, carry out step 8 onwards.

#### 2. F FWD mode (Beginning portion of the tape)

Set the beginning portion of the HR2-1A tape (from 5:00 to 10:00) into the F FWD mode. Check to see that the tape running meets specification 2. If it does not, carry out step 8 onwards.

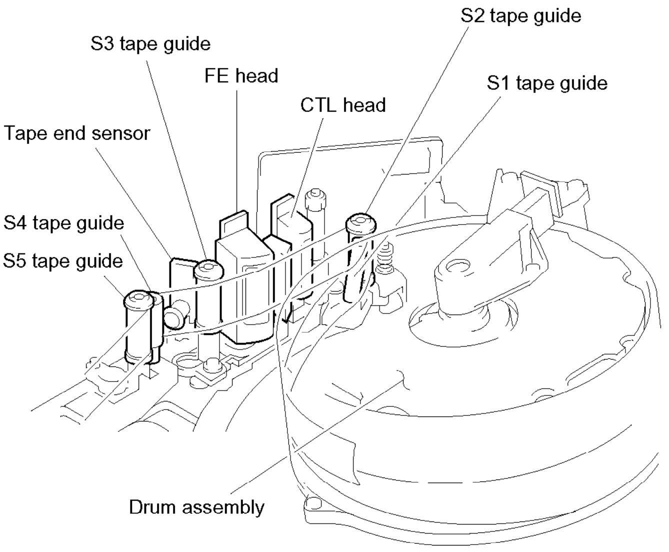
#### 3. REW mode (Beginning portion of the tape)

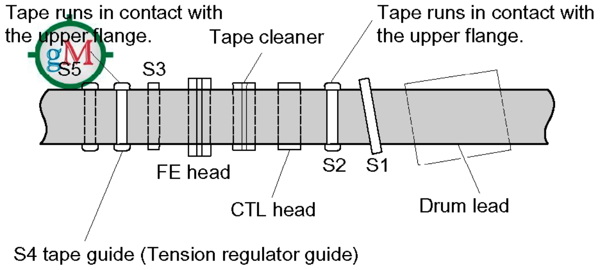
Set the beginning portion of the HR2-1A tape (from 5:00 to 10:00) into the REW mode. Check to see that the tape running meets the specification 2. If it does not, carry out step 8 onwards.

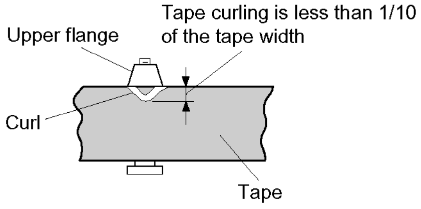
#### 4. PLAY mode (End portion of the tape)

Set the end portion of the cassette tape (BCT-40HD) (from 30:00 to 40:00) into the PLAY mode.
Check to see that the tape running meets the specification 1. If it does not, carry out step 8 onwards.

Drum entrance side (Threading end mode)


S2 tape guide
S3 tape guide
FE head
S1 tape guide
CTL head
Tape end sensor
S4 tape guide
S5 tape guide
Drum assembly


Tape runs in contact with the upper flange.
Tape cleaner
Tape runs in contact with the upper flange.
S5
S3
FE head
S2
S1
CTL head
Drum lead
S4 tape guide (Tension regulator guide)


Upper flange
Tape curling is less than 1/10 of the tape width
Curl
Tape

**Specification 1:**

(A) S5 tape guide
The tape runs at the center between the upper and lower flanges without curling.

(B) S4 tape guide (Tension regulator guide)
The tape runs in contact with the upper flange.
Tape curling is allowed up to 1/10 of the tape width.

(C) S2 tape guide
The tape runs in contact with the upper flange.
Tape curling is allowed up to 1/10 of the tape width.

(D) Drum lead
The tape runs in contact with the drum lead without curling.

## 5. REV mode (End portion of the tape)

(1) Set dip switch S1-1 of the HN-243 board to ON.
The red LED will light up.

(2) Press the S3 switch of the HN-243 board ten times.
After pressing, make sure that MODE display LEDs 3 and 1 are lit.

(3) Set the PLAY mode at the end portion (from 30:00 to 40:00) of the cassette tape (BCT-40HD), and press the REW button several seconds later.
This sets the unit into the REV × 1 mode.
Check to see that the tape runs satisfying (B) and (C) in specification 2.
If (B) and (C) in specification 2 are not satisfied, perform step 8 onwards.

(4) Set dip switch S1-1 of the HN-243 board to OFF.
The red LED will go off.

## 6. F FWD mode (End portion of the tape)

Set the end portion of the BCT-40HD tape (from 30:00 to 40:00) into the F FWD mode. Check to see that the tape running meets (A), (B), and (C) in specification 2.
If not, perform step 8 onwards.

## 7. REW mode (End portion of the tape)

Set the end portion of the BCT-40HD tape (from 30:00 to 40:00) into the REW mode. Check to see that the tape running meets (A), (B), and (C) in specification 2.
If not, perform step 8 onwards.

**Specification 2:**

(A) Upper flange of the S2 tape guide
The tape runs without curling.
Tape curling is allowed up to 1/10 of the tape width.

(B) Upper or lower flange of the S4 tape guide (tension regulator guide)
The tape runs without curling.
Tape curling is allowed up to 1/10 of the tape width.

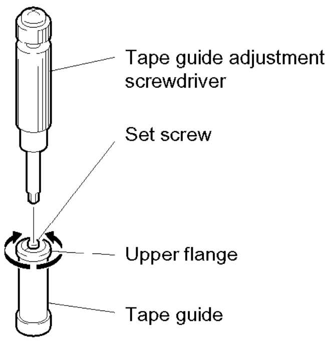
(C) Upper or lower flange of the S5 tape guide
The tape runs without curling.
Tape curling is allowed up to 1/10 of the tape width.

(D) Drum lead
The tape runs in contact with the drum lead without curling.

## Adjustments

### 8. S2, S4 (tension regulator), and S5 tape guides height adjustment

(1) Set the beginning portion of the HR2-1A tape (from 5:00 to 10:00) into the PLAY mode.
(2) Loosen the set screws at the top of the guides using the tape guide adjustment screwdriver. Turn the upper flanges of the guides, and adjust the heights of the guides so that specifications 1 and 2 are satisfied.
(3) Tighten the screws at the top of the tape guides.



### 9. Tape running re-check at the drum entrance side

Carry out steps 1 to 7 of Checks, and re-check that the specifications are satisfied. If they are not, carry out step 8 onwards again.

### 10. Tape running check at the drum exit side.

Check the tape running at the drum exit side on the following page and later.

## Checks after adjustments

### 11. Video tracking check

Refer to Section 4-2-3.

### 12. CTL head height check

Refer to Section 4-2-4.

### 13. CTL head position check

Refer to Section 4-2-5.

### 14. CUE/TC head position check

Refer to Section 4-2-9.

## Drum Exit Side

### Checks

#### 1. PLAY mode (Beginning portion of the tape)

Set the beginning portion of the HR2-1A tape (from 5:00 to 10:00) into the PLAY mode. Check to see that the tape running meets specification 3.
If not, perform step 9 onwards.

#### 2. F FWD mode (Beginning portion of the tape)

Set the beginning portion of the HR2-1A tape (from 5:00 to 10:00) into the F FWD mode. Check to see that the tape running meets specification 3.
If not, perform step 9 onwards.

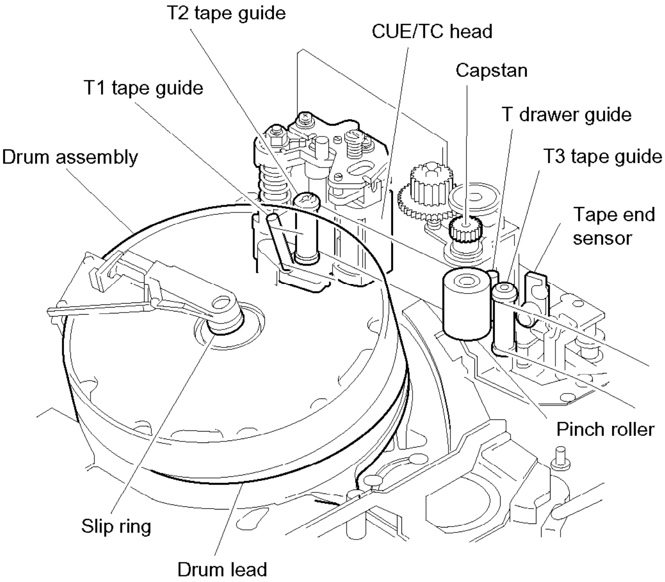
#### 3. REW mode (Beginning portion of the tape)

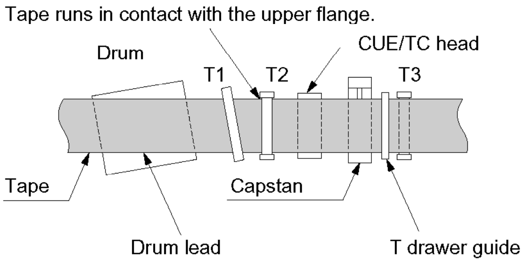
Set the beginning portion of the HR2-1A tape (from 5:00 to 10:00) into the REW mode. Check to see that the tape running meets specification 4.
If not, perform step 9 onwards.

#### 4. PLAY mode (End portion of the tape)

Set the end portion of the BCT-40HD tape (from 30:00 to 40:00) into the PLAY mode. Check to see that the tape running meets specification 3.
If not, perform step 9 onwards.

Drum exit side (Threading end mode)


T2 tape guide
CUE/TC head
Capstan
T1 tape guide
T drawer guide
Drum assembly
T3 tape guide
Tape end sensor
Pinch roller
Slip ring
Drum lead


Tape runs in contact with the upper flange.
Drum
CUE/TC head
T1
T2
T3
Tape
Capstan
Drum lead
T drawer guide

**Specification 3:**

(A) T2 tape guide
The tape runs in contact with the upper flange.
Tape curling is allowed up to 1/10 of the tape width.

(B) T3 tape guide
The tape runs without contacting the upper and lower flanges.

(C) Drum lead
The tape runs in contact with the drum lead without curling.

### 5. REV mode (End portion of the tape)

(1) Set dip switch S1-1 of the HN-243 board to ON.
The red LED will light up.

(2) Press the S3 switch of the HN-243 board ten times.
After pressing, make sure that MODE display LEDs 3 and 1 are lit.

(3) Set the PLAY mode at the end portion (from 30:00 to 40:00) of the cassette tape (BCT-40HD), and press the REW button several seconds later.
This sets the unit into the REV × 1 mode.
Check to see that the tape runs satisfying (B) in specification 4.
If (B) in specification 4 is not satisfied, perform step 9 onwards.

(4) Set dip switch S1-1 of the HN-243 board to OFF.
The red LED will go off.

**Specification 4:**

(A) T2 tape guide
The tape runs in contact with the upper flange.
Tape curling is allowed up to 1/10 of the tape width.

(B) T3 tape guide
There should be no tape curling at the upper flange.
There should be a clearance between the lower flange and lower edge of the tape.
When the REV mode is set, the tape running position should not be lower than that in the PLAY mode.

(C) Drum lead
The tape runs in contact with the drum lead without curling.

### 6. F FWD mode (End portion of the tape)

Set the end portion of the BCT-40HD tape (from 30:00 to 40:00) into the F FWD mode. Check to see that the tape running meets specification 5. If not, perform step 9 onwards.

**Specification 5:**

(A) Upper flange of the T2 tape guide
The tape runs without curling.
Tape curling is allowed up to 1/10 of the tape width.

(B) Upper and lower flanges of the T3 tape guide
The tape runs without curling.

### 7. REW mode (End portion of the tape)

Set the end portion of the BCT-40HD (from 30:00 to 40:00) into the REW mode. Check to see that the tape running meets specification 5. If not, perform step 9 onwards.

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## 8. Tape running check around the capstan shaft

(1) Set the end portion of the BCT-40HD tape (from 30:00 to 40:00) into the REW mode. After several seconds, set it into the F FWD mode.
When changing the mode, check that the tape running meets specification 6 between the CUE/TC head and capstan shaft.
If not, perform step 9 on wards.

(2) Repeat step (1) two or three times and check again.

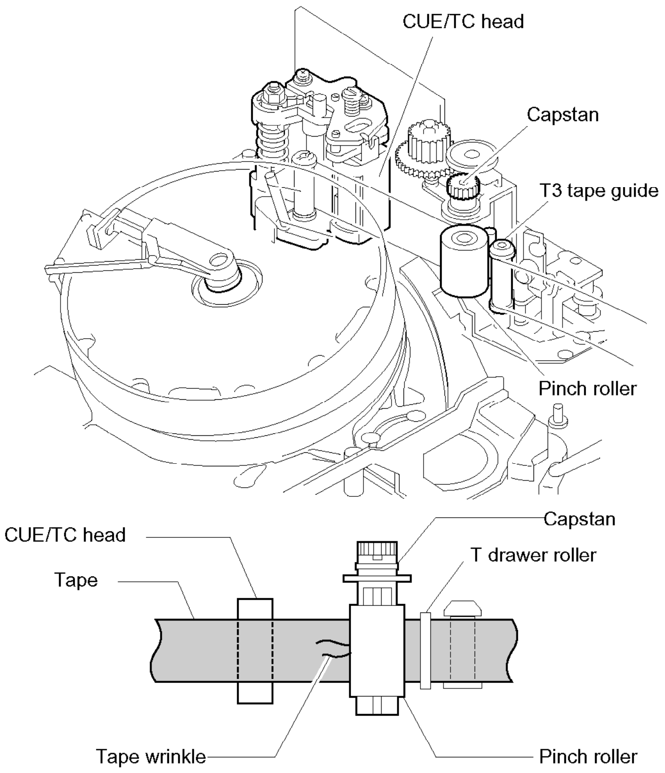
(3) Set the F FWD mode, and then the REW mode after several seconds.
When changing the mode, check that the tape running meets specification 6 between the CUE/TC head and capstan shaft.
If not, perform step 9 on wards.

(4) Set dip switch S1-1 of the HN-243 board to ON.
The red LED will light up.

(5) Press the S3 switch of the HN-243 board ten times.
After pressing, make sure that MODE display LEDs 3 and 1 are lit.

(6) Press the REW button to set the REV × 1 mode, and after several seconds, press the PLAY button.
When changing the mode, check to see that the tape running meets specification 6 between the CUE/TC head and capstan shaft.
If specification 6 is not met, perform step 9 onwards.

(7) Set dip switch S1-1 of the HN-243 board to OFF.
The red LED will go off.



**Specification 6:**
Tape runs without any wrinkles.
If the tape wrinkles, check that the tape wrinkle disappears within 2 seconds and the tape is not damaged.

## Adjustments

### 9. T2 and T3 tape guides height adjustment

(1) Set the beginning portion of the HR2-1A (from 5:00 to 10:00) into the PLAY mode.

(2) Loosen the set screws at the top of the guides using the tape guide adjustment screwdriver. Turn the upper flanges of the guides, and adjust the heights of the guides to satisfy specifications 3 to 6.

### Adjustment know how for the specification is not satisfied in the REV ×1 mode

- Rotate the upper flange of the T3 tape guide in the REV mode, and adjust the height until the tape does not curl.
- After adjusting, set the unit into the PLAY mode, and make sure that there is a clearance between the upper and lower flanges of the T3 tape guide and the tape.

(3) Tighten the set screws at the top of the tape guides.

### 10. Tape running re-check at the drum exit side

Carry out steps 1 to 8 of the check procedures, and re-check that the specifications are satisfied. If the specifications are not satisfied, carry out the adjustment of step 9 again.

### 11. Tape running re-check at the drum entrance side

Re-check the tape running at the drum entrance side.

## Checks and adjustments after this adjustment

### 12. Video tracking adjustment

Refer to Section 4-2-3.

### 13. CUE head height check

Refer to Section 4-2-6.

### 14. CUE head azimuth adjustment

Refer to Section 4-2-7.

### 15. CUE head tape-to-head contact check

Refer to Section 4-2-8.

### 16. CTL head position check

Refer to Section 4-2-5.

### 17. CUE/TC head position check

Refer to Section 4-2-9.

## 4-2-3. Video Tracking Adjustment

### Notes

- Tighten the screws at the top of the tape guides at the following tightening torque.
  $9 \times 10^{-2}$ N•m (0.9 kgf•cm)
- After this adjustment, be sure to perform the tape running adjustment, and apply locking compound to the screws at the top of each tape guide.

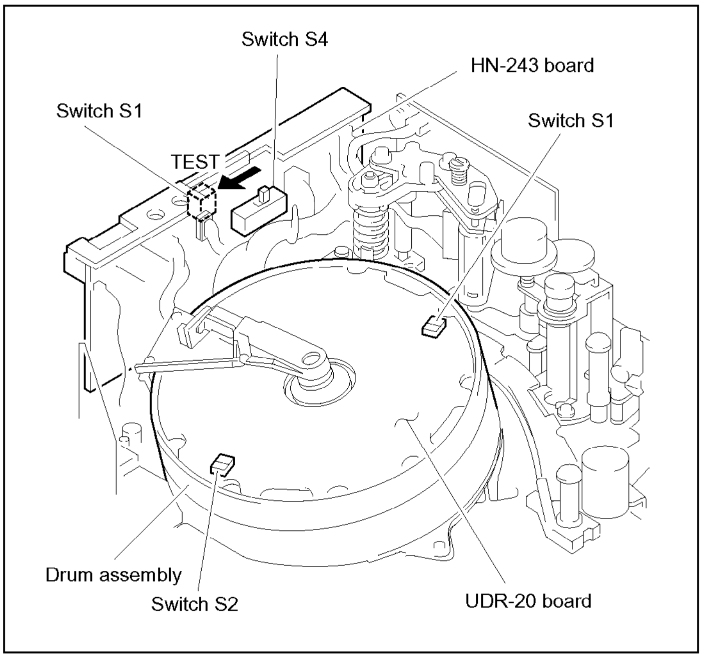
### Tools

| | |
|---|---|
| • Tape guide adjustment screwdriver (45) : | J-6322-420-A |
| • Inspection mirror (small oval) : | J-6080-840-A |
| • TP tool : | J-6510-070-A |
| • Alignment tape, HR2-1A : | 8-960-076-11 |

- Oscilloscope (Sony Tektronix 2465B or the equivalent)

### Preparations

1. Turn the power off.
2. Connect the 8pin connector of the TP tool to the CN7 connector on the HN-243 board.
3. Connect the 5pin connector of the TP tool to the CN3 connector on the CTL-10 board.
4. Set all four switches of switches S1 and S2 on the UDR-20 board attached to the upper drum to TEST (ON).
5. Set switch S4 on the HN-243 board to TEST.
6. Set switches S1-1 and S1-2 on the HN-243 board to OFF.
7. Connect an oscilloscope.
   CH-1 : REC RF A/TP tool board
   TRIG : REC RF CF/TP tool board
8. Turn the power on.
9. Load the alignment tape HR2-1A.



## Checks

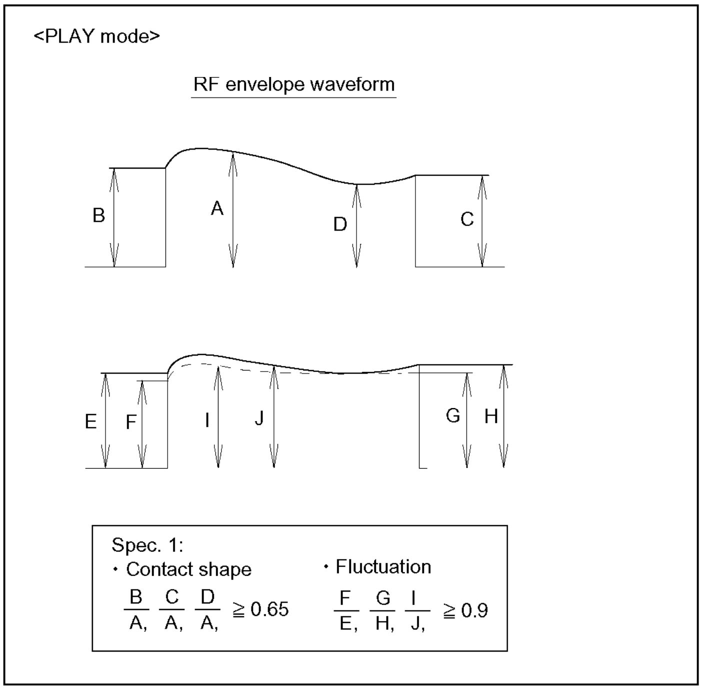
### 1. PLAY mode

(1) Set switch S1-2 on the HN-243 board to ON so that the tracking control (⊘RV1/HN-243 board) can be operated.
(2) Play back the HR2-1A (from 00:00 to 15:00).
(3) Turn the tracking control in the clockwise direction, and set the RF envelope waveform to 80% of the maximum output level. At the same time, check to see that the RF envelope waveform satisfies specification 1.
If the specification 1 is not satisfied, carry out step 3 onwards (drum at entrance side or drum at exit side).

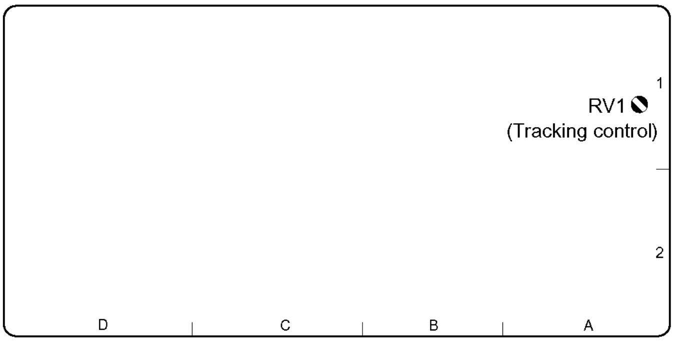
### 2. RF envelope waveform check

(1) Check to see that when the unit is moved from the horizontal position to the vertical, the RF envelope waveform satisfies specification 1.
If it does not, carry out step 3 and onwards (drum at entrance side or drum at exit side).
(2) Check to see that when the unit is positioned horizontally again and the mode is changed from EJECT to PLAY 2 or 3 times, the RF waveform during the PLAY mode is the same as the pre-PLAY mode, does not change, and satisfies specification 1. If the RF waveform changes or specification 1 is not satisfied, carry out step 3 and onwards (drum at entrance side or drum at exit side).
(3) Check to see that when the mode is changed from REV search* to PLAY two or three times, the RF envelope waveform during the PLAY mode is the same as the pre-PLAY mode, does not change, and satisfies specification 1. If the RF waveform changes or specification 1 is not satisfied, carry out step 3 and onwards (drum at entrance side or drum at exit side).

*: REV search mode
Press the REW button after pressing the PLAY button.
(The PLAY and REW buttons on the keyboard light up.)



Spec. 1:
- Contact shape $\frac{B}{A}, \frac{C}{A}, \frac{D}{A} \geqq 0.65$
- Fluctuation $\frac{F}{E}, \frac{G}{H}, \frac{I}{J} \geqq 0.9$



HN-243 BOARD (B Side)

(4) Check to see that when the mode is changed from STOP to PLAY two or three times, the RF envelope waveform during the PLAY mode is the same as the pre-PLAY mode, does not change, and satisfies specification 1.

---

## Adjustments
## Drum at entrance side

### 3. Tracking adjustment of drum at entrance side

(1) Play back the HR2-1A (from 00:00 to 15:00).
(2) Loosen the set screw at the top of the S2 guide using the tape guide adjustment screwdriver.
(3) Turn the upper flange of the S2 tape guide counterclockwise using the tape guide adjustment screwdriver to generate the 1.5 peaks shown in the figure. (Fig. 1)
Check that a clearance exists between the lower flanges of the S4 tape guide (tension regulator guide) and the lower edge of the tape, and between S5 tape guide and the lower edge ather tape.
If no clearance exists, adjust the height of the S4 tape guide (tension regulator guide) and S5 tape guide.
(4) Check to see that no clearance exists between the upper flange of the S2 tape guide and the upper edge of the tape.
(5) Turn the upper flange of the S2 tape guide clockwise so that the RF waveform becomes flat.
(6) Set switch S1-2 on the HN-243 board to ON so that the tracking control can be operated.
(7) Play back the HR2-1A (from 00:00 to 15:00).
(8) Turn the tracking control in the clockwise and counterclockwise direction, so that RF waveform reaches 80% of the maximum output level. Fine adjust the height of S2 tape guide so that the beginning (range of approximately 0.5 msec.) of each RF waveform becomes the identical in shape and meets the specification 1. (Refer to Fig. 2.)
(9) Tighten the set screw at the top of the S2 tape guide.
(10) Loosen the set screw at the upper flange of the S5 tape guide. Turn and adjust the upper flange so that the tape runs in contact with the upper flange.
(11) Tighten the set screw at the top of the S5 tape guide.

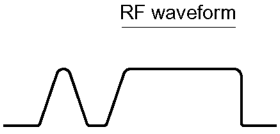


Fig. 1

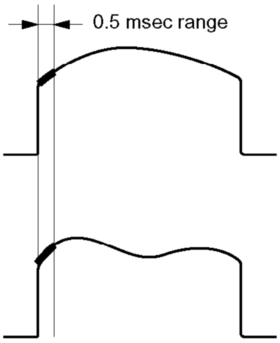


Fig. 2

### 4. Video tracking re-check

Carry out steps 1 and 2 of the checks and re-check the video tracking.

### 5. Tape running check

Check the tape running condition (drum at entrance side) according to Section 4-2-1.

**Note**

After adjustment, be sure to set switch S1-2 on the HN-243 board to OFF.

## Drum at exit side

### 6. Tracking adjustment at drum exit side

(1) Play back the HR2-1A (from 00:00 to 15:00).
(2) Loosen the set screw at the top of the T2 tape guide using the tape guide adjustment screwdriver.
(3) Turn the upper flange of the T2 tape guide counterclockwise using the tape guide adjustment screwdriver to generate the 1.5 peaks shown in the figure. (Fig. 3)
Check to see that a clearance exists between the lower flange of the T3 tape guide and the lower edge of the tape.
If no clearance exists, adjust the height of the T3 tape guide.
(4) Check to see that no clearance exists between the upper flange of the T2 tape guide and the upper edge of the tape.
(5) Turn the upper flange of the T2 tape guide clockwise so that the RF waveform becomes flat.
(6) Set switch S1-2 on the HN-243 board to ON so that the tracking control can be operated.
(7) Play back the HR2-1A (from 00:00 to 15:00).
(8) Turn the tracking control in the clockwise and counterclockwise direction, so that RF waveform reaches 80% of the maximum output level. Fine adjust the height of T2 tape guide so that the ending (range of approximately 0.5 msec.) of each RF waveform becomes the identical in shape and meets the specification 1. (Refer to Fig. 4.)
(9) Tighten the set screw at the top of the T2 tape guide.
(10)Loosen the set screw at the upper flange of the T3 tape guide. Turn and adjust the upper flange so that the tape does not run in contact with the upper and lower flanges.
(11)Tighten the set screw at the top of the T3 tape guide.

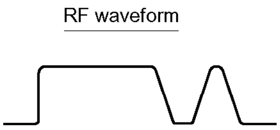


Fig. 3

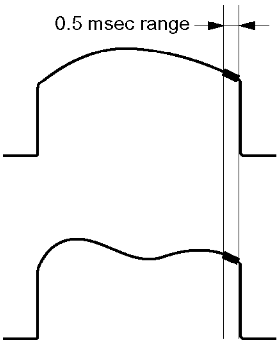


Fig. 4

### 7. Video tracking re-check

Carry out steps 1 and 2 of the checks and re-check the video tracking.

### 8. Tape running check

Check the tape running condition (drum at exit side) according to Section 4-2-1.

**Note**

After adjustment, be sure to set switch S1-2 on the HN-243 board to the OFF.

---

## Checks and adjustments after this adjustment

### 9. CTL head height adjustment

Refer to Section 4-2-4.

### 10. CUE head height check

Refer to Section 4-2-6.

### 11. CUE head azimuth adjustment

Refer to Section 4-2-7.

### 12. CUE head tape-to-head contact check

Refer to Section 4-2-8.

### 13. CTL head position check

Refer to Section 4-2-5.

### 14. CUE/TC head position check

Refer to Section 4-2-9.

### 15. Servo system adjustment

Refer to Section 6-5.

## 4-2-4. CTL Head Height Adjustment

### Tools

- TP tool : J-6510-070-A
- Alignment tape, HR2-1A : 8-960-076-11
- Nut driver (4.5 mm)
- Oscilloscope (Sony Tektronix 2465B or the equivalent)

### Setting

1. Turn the power off.
2. Connect the 8pin connector of the TP tool to the CN7 connectoron the HN-243 board.
3. Connect the 5pin connector of the TP tool to the CN3 connector on the CTL-10 board.
4. Set switches S1-1 and S1-2 on the HN-243 board to OFF.
5. Connect an oscilloscope.
   CH-1: PB CTL/TP tool board
   TRIG: SV REF CF/TP tool board
6. Turn the power on.
7. Load the alignment tape HR2-1A.

## Checks

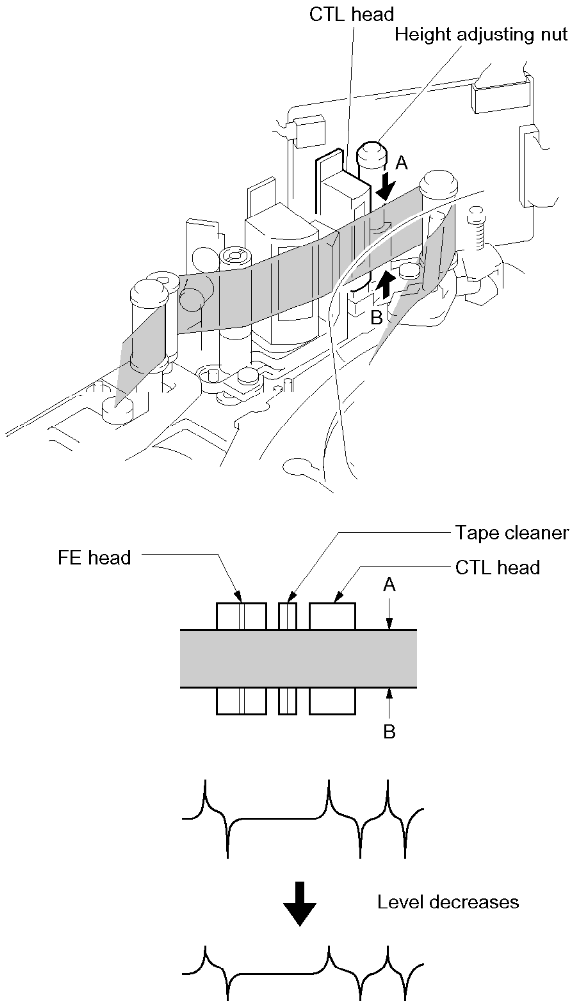
### 1. PLAY mode

Play back the alignment tape HR2-1A.

### 2. CTL head height check

(1) Check to see that when portion A of the tape shown in the figure is pressed down, the level decreases.
If the level increases, carry out step 3.

(2) Check to see that when portion B is pushed up, the level decreases. If the level increases, carry out step 4.



Spec. : The level decreases when the alignment tape is pressed down and pushed up.

## Adjustments

### 3. If the level increases when the tape is pressed down

Turn the height adjusting nut counterclockwise, and adjust so that the output waveform is the maximum.

### 4. If the level increases when the tape is pushed up

Turn the height adjusting nut clockwise, and adjust so that the output waveform is the maximum.

## Asjustments after this adjustment

### 5. CTL head position check

Refer to Section 4-2-5.

### 6. CUE/TC head position check

Refer to Section 4-2-9.

### 7. Servo system adjustment

Refer to Section 6-5.

## 4-2-5. CTL Head Position Adjustment

### Notes

- The CTL head position adjustment is closely related to the CUE/TC head position adjustment.
- After carrying out the CTL head position adjustment, be sure to carry out the CUE/TC head position adjustment.

### Tools

| | |
|---|---|
| • TP tool : | J-6510-070-A |
| • Alignment tape, HR2-1A : | 8-960-076-11 |
| • Torque screwdriver bit (for M2) : | J-6325-380-A |
| • Torque screwdriver (for 3 kg) : | J-6325-400-A |
| • Oscilloscope (Sony Tektronix 2465B or the equivalent) | |

### Setting

1. Turn the power off.
2. Connect the 8pin connector of the TP tool to the CN7 connectoron the HN-243 board.
3. Connect the 5pin connector of the TP tool to the CN3 connector on the CTL-10 board.
4. Set switches S1-1 and S1-2 on the HN-243 board to OFF.
5. Connect an oscilloscope.
   CH-1 : REC A RF/TP tool board
   CH-2 : SHAPED CTL/TP tool board
   TRIG : SV REF CF/TP tool board
6. Turn the power on.
7. Load the alignment tape HR2-1A.

## Checks

### 1. CTL head position check

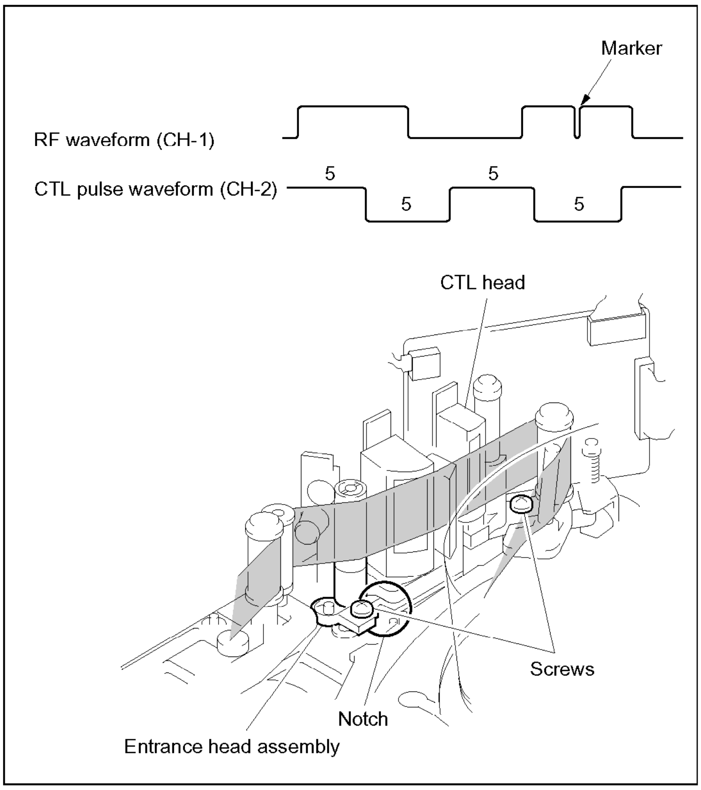
(1) Play back the alignment tape HR2-1A (from 00:00 to 15:00).

(2) Set switch S1-2 on the HN-243 board to ON so that the tracking control (⊘RV1/HN-243 board) can be operated.

(3) Turn the tracking control so that the output level at the center of the RF waveform (with marker) is the maximum.

(4) Set switch S1-2 on the HN-243 board to OFF and set the tracking control to fixed state.

(5) Check to see that the output level of the RF waveform with the marker does not change and is the same as the level of step (3).
If the specification is not satisfied, carry out step 2 onwards.



## Adjustments

### 2. CTL head position adjustment

(1) Turn the two screws which secure the entrance head assembly 1/4 to 1/2 turn.

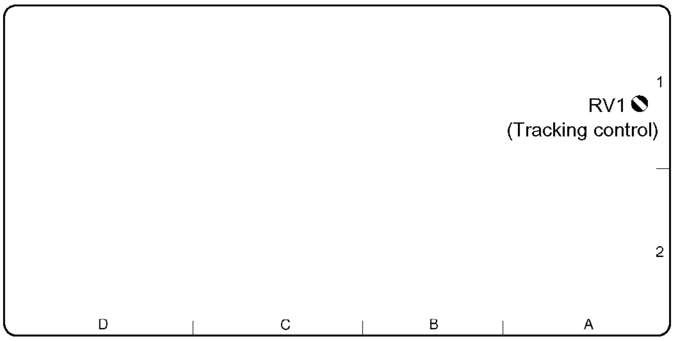
(2) Insert the 3 mm flatblade screwdriver in the notch of the entrance head assembly.

(3) Turn the 3 mm flat-bladed screwdriver and adjust the CTL head position so that the marker of the RF waveform is output during the low level of the CTL pulse waveform, and the output level at the center of the RF waveform is the maximum.

(4) While holding the 3 mm flat-bladed screwdriver in step (3), tighten the two screws.

### 3. CTL head position re-check

Re-check the CTL head position according to step 1.



HN-243 BOARD (B Side)

## Adjustment after this adjustment

### 4. CUE/TC head position check

Refer to Section 4-2-9.

## 4-2-6. CUE Head Height Adjustment

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### Notes

- The CUE head height adjustment is closely related to the azimuth, zenith and position adjustments of the CUE head.
- After carrying out the CUE head height adjustment, be sure to carry out those adjustments of the CUE head.

---

### Tools

| | |
|---|---|
| • Alignment tape, HR2-1A : | 8-960-076-11 |
| • TP tool : | J-6510-070-A |

- Nut driver (4.5 mm)
- Oscilloscope (Sony Tektronix 2465B or the equivalent)

---

### Setting

1. Turn the power off.
2. Connect the 8pin connector of the TP tool to the CN7 connector on the HN-243 board.
3. Connect the 5pin connector of the TP tool to the CN3 connector on the CTL-10 board.
4. Set switches S1-1 and S1-2 on the HN-243 board to OFF.
5. Connect an oscilloscope.
   CH-1: PB CUE/TP tool board
6. Turn the power on.
7. Load the alignment tape HR2-1A.

## Checks

### 1. CUE head height check

(1) Play back the alignment tape HR2-1A (from 00:00 to 15:00).

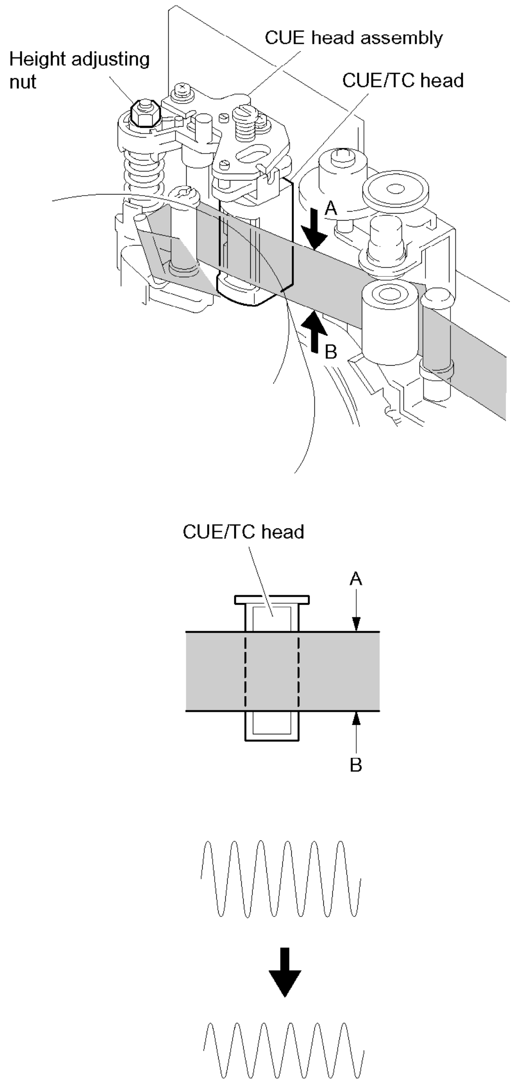
(2) Check to see that when portion A of the tape shown in the figure is pressed down, the level decreases. If the level increases, carry out step 2.

(3) Check to see that when portion B is pushed up, the level decreases. If the level increases, carry out the step 3.

(4) Change the mode from EJECT to PLAY 2 or 3 times. Check to see that the output level is the same as the pre-PLAY level and does not change.
If the level changes, carry out step 2 or 3.

(5) Change the mode from REV search* to PLAY 2 or 3 times. Check to see that the output level is the same as the pre-PLAY level and does not change.
If the level changes, carry out step 2 or 3.

*: REV search mode
Press the REW button after pressing the PLAY button.
(The PLAY and REW buttons on the keyboard light up.)



Spec. : The level decreases when the alignment tape is pressed down and pushed up.

## Adjustments

### 2. If the level increases when the tape is pressed down

If the level increases when the tape is pressed down, turn the height adjusting nut counterclockwise and adjust so that the output waveform is the maximum.

### 3. If the level increases when the tape is pushed up

If the level increases when the tape is pushed up, turn the height adjusting nut clockwise and adjust so that the output waveform is the maximum.

### 4. CUE head azimuth adjustment

Refer to Section 4-2-7.

### 5. CUE head head-to-contact check

Refer to Section 4-2-8.

### 6. CUE/TC head position check

Refer to Section 4-2-9.

### 7. CUE head height check

Re-check according to step 1.

## 4-2-7. CUE Head Azimuth Adjustment

### Notes

- It is very difficult to check whether the CUE head azimuth has been correctly adjusted in terms of the tape running system. Therefore, perform the following adjustments only.
- The CUE head azimuth adjustment is closely related to the position and height adjustments of the CUE head.
  After carrying out the CUE head azimuth adjustment, be sure to carry out those adjustments of the CUE head.

### Tools

- Alignment tape, HR2-1A : 8-960-076-11
- TP tool : J-6510-070-A
- Oscilloscope (Sony Tektronix 2465B or the equivalent)

### Setting

1. Turn the power off.
2. Connect the 8pin connector of the TP tool to the CN7 connector on the HN-243 board.
3. Connect the 5pin connector of the TP tool to the CN3 connector on the CTL-10 board.
4. Set switches S1-1 and S1-2 on the HN-243 board to OFF.
5. Connect an oscilloscope.
   CH-1: PB CUE/TP tool board
6. Turn the power on.
7. Load the alignment tape HR2-1A.

## Adjustments

### 1. CUE head azimuth adjustment

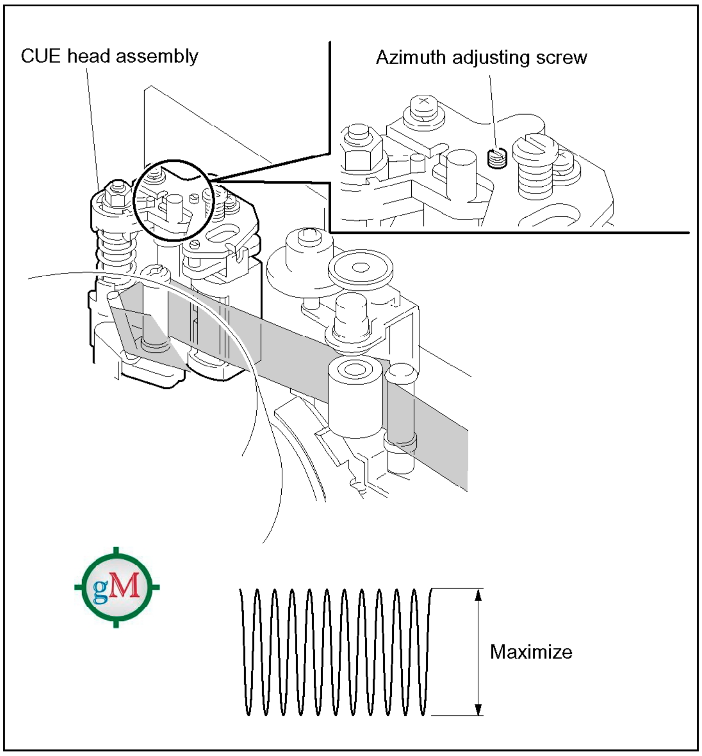
(1) Play back the alignment tape HR2-1A (from 15:00 to 30:00).

(2) Turn the azimuth adjusting screw clockwise or counterclockwise so that the output waveform is the maximum.

(3) Change the mode from EJECT to PLAY two or three times. Check to see that the output level is the same as the level in step (2) and does not change.

(4) Change the mode from REV search* to PLAY two or three times. Check to see that the output level is the same as the level in step (2) and does not change.

*: REV search mode
Press the REW button after pressing the PLAY button.
(The PLAY and REW buttons on the keyboard light up.)



### 2. CUE head head-to-tape contact adjustment

Refer to Section 4-2-8.

### 3. CUE head height check

Refer to Section 4-2-6.

### 4. CUE/TC head position check

Refer to Section 4-2-9.

## 4-2-8. CUE Head Head-to-tape Contact Adjustment

### Notes

- The CUE head head-to-tape contact adjustment is closely related to the height, azimuth and position adjustments of the CUE head.
  After the CUE head head-to-tape contact adjustment, be sure to carry out those adjustments of the CUE head.

### Tools

- Alignment tape, HR2-1A : 8-960-076-11
- Torque screwdriver bit (for M2) : J-6325-380-A
- Torque screwdriver (for 3 kg) : J-6325-400-A
- TP tool : J-6510-070-A
- Oscilloscope (Sony Tektronix 2465B or the equivalent)

### Setting

1. Turn the power off.
2. Connect the 8pin connector of the TP tool to the CN7 connector on the HN-243 board.
3. Connect the 5pin connector of the TP tool the CN3 connector on the CTL-10 board.
4. Set switches S1-1 and S1-2 on the HN-243 board to OFF.
5. Connect an oscilloscope.
   CH-1: PB CUE/TP tool board
   TRIG: CH-1
6. Turn the power on.
7. Load the alignment tape HR2-1A.

## Checks

### 1. CUE head head-to-tape contact check

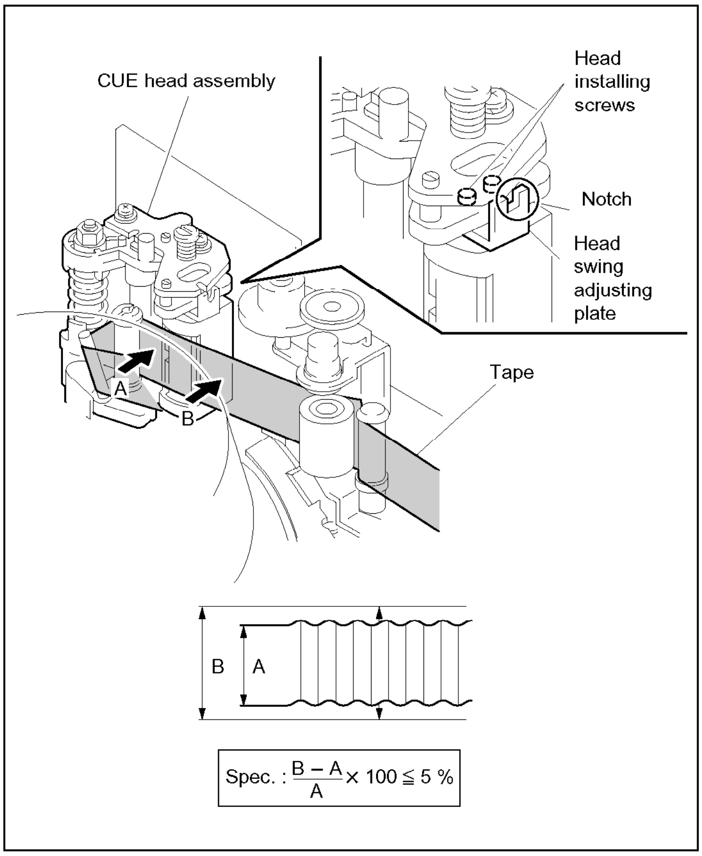
(1) Play back the alignment tape HR2-1A (from 00:00 to 15:00).

(2) Press the portions A and B of the tape lightly, as shown in the figure.

(3) Check to see that the increase in the output level satisfies the specification.

Specification: The increase in the output level should be within 5%.

If the specification is not satisfied, carry out step 2 onwards.



Spec. : $\frac{B - A}{A} \times 100 \leqq 5\ \%$

## Adjustments

### 2. CUE head head-to-tape contact adjustment

(1) Loosen the two head installing screws by 1/4 to 1/2 of a turn.

(2) Insert the 2 mm flatblade screwdriver in the notch of the head swing adjusting plate.

(3) Turn the 2 mm flatblade screwdriver and adjust the CUE head position so that the output level is the maximum.

(4) While holding the 2 mm flatblade screwdriver in step (3), tighten the two screws.

### 3. CUE head head-to-tape contact re-check

Re-check according to step 1.

### 4. CUE head azimuth adjustment

Refer to Section 4-2-7.

### 5. CUE head head-to-tape contact check

Refer to Section 4-2-8.

### 6. CUE head height check

Refer to Section 4-2-6.

### 7. CUE/TC head position check

Refer to Section 4-2-9.

## 4-2-9. CUE/TC Head Position Adjustment

### Notes

- Carry out this adjustment after completing the CTL head position adjustment. Adjust the CUE/TC head position according to the position of the CTL head as a reference.
- The CUE/TC head position adjustment is closely related to the height, azimuth and head-to-tape contact adjustments of the CUE head. After CUE/TC head position adjustment, be sure to carry out those adjustments of the CUE head.

### Tools

- Alignment tape, HR2-1A : 8-960-076-11
- Torque screwdriver bit (for M2) : J-6325-380-A
- Torque screwdriver (for 3 kg) : J-6325-400-A
- TP tool : J-6510-070-A
- Oscilloscope (Sony Tektronix 2465B or the equivalent)

### Setting

1. Turn the power off.
2. Connect the 8pin connector of the TP tool to the CN7 connector on the HN-243 board.
3. Connect the 5pin connector of the TP tool to the CN3 connector on the CTL-10 board.
4. Set switches S1-1 and S1-2 on the HN-243 board to OFF.
5. Connect an oscilloscope.
   CH-1 : SHAPED CTL/TP tool board
   CH-2 : TC/TP tool board
   TRIG : SV REF CF/TP tool board
6. Turn the power on.
7. Load the alignment tape HR2-1A.

## Checks

### 1. CUE/TC head position check

(1) Play back the alignment tape HR2-1A (from 00:00 to 15:00).

(2) Check to see that the positional relation between the falling edge of the CTL pulse waveform and the rising edge of the TC waveform satisfies the specification, as shown in the figure.

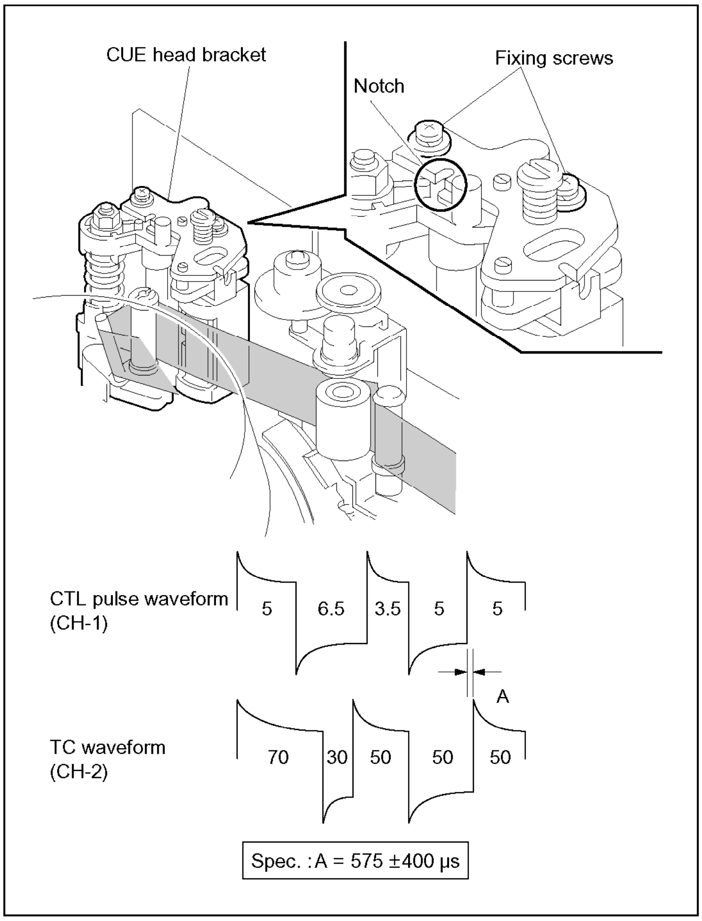
Specification: A = 575 ±400 μs

If the specification is not satisfied, carry out step 2 onwards.

(3) Change the mode from EJECT to PLAY 2 or 3 times, and check to see that the specification is satisfied.
If it is not, carry out step 2 onwards.

(4) Change the mode from REV search* to PLAY two or three times, and check to see that the specification is satisfied.
If the specification is not satisfied, carry out step 2 onwards.

*: REV search mode
Press the REW button after pressing the PLAY button.
(The PLAY and REW buttons on the keyboard light up.)



Spec. :A = 575 ±400 μs

## Adjustment

### 2. CUE/TC head position adjustment

(1) Loosen the screws of the CUE head bracket 1/4 to 1/2 turn.

(2) Insert the 3 mm flatblade screwdriver in the notch of the CUE head bracket.

(3) Turn the 3 mm flatblade screwdriver and adjust the CUE/TC head position so that the specification is satisfied.

(4) While holding the 3 mm flatblade screwdriver in step (3), tighten the two screws.

### 3. CUE/TC head position re-check

Re-check according to step 1.

**4. CUE head azimuth adjustment**

Refer to Section 4-2-7.

**5. CUE head head-to-tape contact check**

Refer to Section 4-2-8.

**6. CUE head height check**

Refer to Section 4-2-6.

**7. CUE/TC head position re-check**

Re-check according to step 1.

## 4-2-10. CUE Output Level Check

### Tools

- Alignment tape, HR2-1A : 8-960-076-11
- TP tool : J-6510-070-A
- Oscilloscope (Sony Tektronix 2465B or the equivalent)

### Setting

1. Turn the power off.
2. Connect the 8pin connector of the TP tool to the CN7 connector on the HN-243 board.
3. Connect the 5pin connector of the TP tool to the CN3 connector on the CTL-10 board.
4. Set switches S1-1 and S1-2 on the HN-243 board to OFF.
5. Connect an oscilloscope.
   CH-1 : PB CUE/TP tool board
   TRIG : CH-1
6. Turn the power on.
7. Load the alignment tape HR2-1A.

### Check

#### 1. CUE output level check

(1) Play back the alignment tape HR2-1A (from 15:00 to 25:00).

(2) Check to see that the fluctuation of the CUE output level satisfies specification 1, as shown in the figure.

(3) Set dip switch S1-1 on the HN-243 board to ON.

(4) Press switch S3 on the HN-243 board 10 times, and confirm the mode display LEDs 1 and 3 light up.

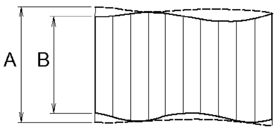
(5) Play back the alignment tape HR2-1A (from 00:00 to 15:00).

(6) Note down the CUE output level. (Take this level as C.)

(7) Press the REW button to set the REV × 1 mode.

(8) Check to see that the CUE output level (Take this level as D.) satisfies specification 2, as shown in the figure.

(9) After checking, set dip switch S1-1 on the HN-243 board to OFF.



Spec. 1 : $\frac{B-A}{A} \times 100 \leqq 5$ % (fluctuation)

Spec. 2 : $\frac{D}{C} \times 100 \geqq 70$ %

# Section 5
# Camera System Electrical Alignment

Following are the adjustment items to be performed when the boards and block inside the camera block are repaired or replaced.
It is not necessary to perform the adjustment for other boards described in the following.

| Board/Block | Adjustment items |
|---|---|
| CCD block | 5-2. Automatic Adjustment |
| AD-167 | 5-2. Automatic Adjustment |
| DA-148 | 5-6. DA-148 Board Adjustment |
| PA-238 | 5-3. PA-238 Board Adjustment |
| SH-74 | 5-4. SH-74 Board Adjustment |
| TG-213 | 5-2. Automatic Adjustment |
| VA-195 | 5-2. Automatic Adjustment |
| VDA-51 | 5-5. VDA-51 Board Adjustment |
| Filter disk unit, ND filter | 5-9. Adjustment After Replacement of ND Filter |
| —— | 5-7. Video System Level Adjustment (When using the Setup Menu)<br>5-8. Video System Level Adjustment (When using MSU) |

*1 : Describes as for the reference to changing the setting data at the request of the customer. Perform these adjustments as for the preferred level.

# 5-1. Preparations

## 5-1-1. Equipment Required

### Measuring equipment

- HDTV digital waveform monitor
  Leader electronic LV5150D or equivalent
  (Equipped with Y, Pb, Pr to R, G, B conversion function)

  **Note**

  MONITOR OUT of the HDW-F900 provides Y, Pb, and Pr signals. Convert them to R, G, B signals using the waveform monitor, if required.
- HD monitor
  Sony BVM-D20F1/BVM-D14H5
- Oscilloscope
  Tektronix TDS460A or equivalent

### Related Equipment

- HDVS camera system
  MSU-700A/750
  HDVF-20A

### Fixtures

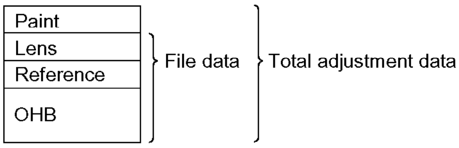
- Pattern box PTB-500
  Sony Part No. : J-6029-140-B
- Grayscale chart (16 : 9 transparent type)
  Sony Part No. : J-6394-080-A
- Grayscale chart (4 : 3 reflective type)
  Commercially available
- Extension board EX-410
  Sony Part No. : J-6420-260-A

## 5-1-2. Precautions on Adjustments

- Turn ON the main power switch (external) before adjusting, and warm up the board for about 10 minutes with the VTR switch set to “SAVE”.
- All measuring equipment must be calibrated.
- Periodic Maintenance must be conducted for the pattern box.
- “Section 5-1-7. Initial Settings” must be completed.

## 5-1-3. File data at adjustment

The file structure of the adjustment data of HDW-F900 is as follows.



- The lens file stores the deferential data from the reference file.
  Mount the lens normally used during the adjustment.
  (Refer to Section 5-6 of the Maintenance Manual Part 1.)
- The reference file stores the custom paint data adjusted by video engineer. And this data is the custom reference setting data. Therefore, before performing adjustment, store this data in the memory stick first, and reset this data from the memory stick after adjustment. (Refer to Section 5-5 of the Maintenance Manual Part 1.)
- The OHB file stores the maintenance data of the CCD block. (Refer to Section 5-7 of the Maintenance Manual Part 1.)

## 5-1-4. Maintaining the Grayscale Chart

For the VA gain adjustment, using an 89.9 %-reflective grayscale chart is preferable.
If a reflective chart is not available, use a well-maintained pattern box and a transparent grayscale chart for adjustment.
Before beginning adjustment, set the illumination of the light source (or the luminous intensity on the chart surface) properly proceeding as follows and set the color temperature to 3200 K exactly by adjusting light.

---

### Information on the reflective grayscale chart (4 : 3)

#### Recommended chart

The reflective grayscale chart (4 : 3) is commercially available.

Recommended chart: Reflective grayscale chart (with a special case)
MURAKAMI COLOR RESEARCH LABORATORY GS-3
or equivalent

Supplier: MURAKAMI COLOR RESEARCH LABORATORY
Address: 3-11-3, Kachidoki, Chuo-ku, Tokyo, JAPAN
Postcode 104-0054
Phone: 81-3-3532-3011
Fax: 81-3-3532-2056

#### Handling precautions

- Do not touch the chart’s surface.
- Do not subject the surface to dirt, scratches or prolonged exposure to sunlight.
- Protect the chart from excess moisture and harmful gas.
- Avoid resting articles against the case.
- Open the case and dry the chart more an hour for a month in no use long period.

#### Replacement period when the chart is used as the reference

The reflective grayscale chart should be replaced every two years if it used as the reference. Because the chart deteriorates with time and proper adjustment cannot be achieved.
Replacement period varies according to storage conditions of the chart.

---

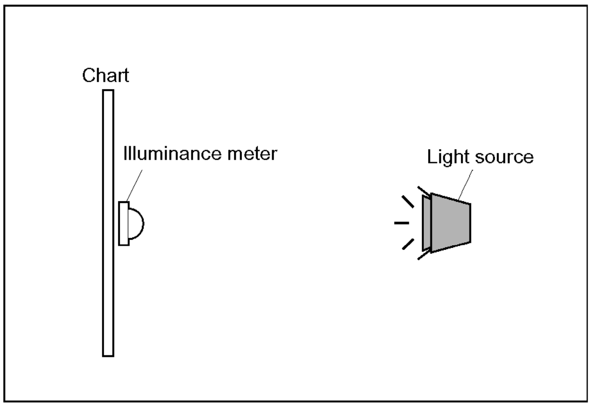
### Setting illumination (when the reflective chart is used)

Equipment: Illuminance meter (Calibrated)

1. Turn on the light source and warm up for about 30 minutes.
2. Place the illuminance meter on the chart surface.
   Adjust the position and angle of the light source so that the whole surface of the chart is evenly 2000 lx.

   **Note**

   Light the chart from almost the same direction and height as the camera to shoot the chart.



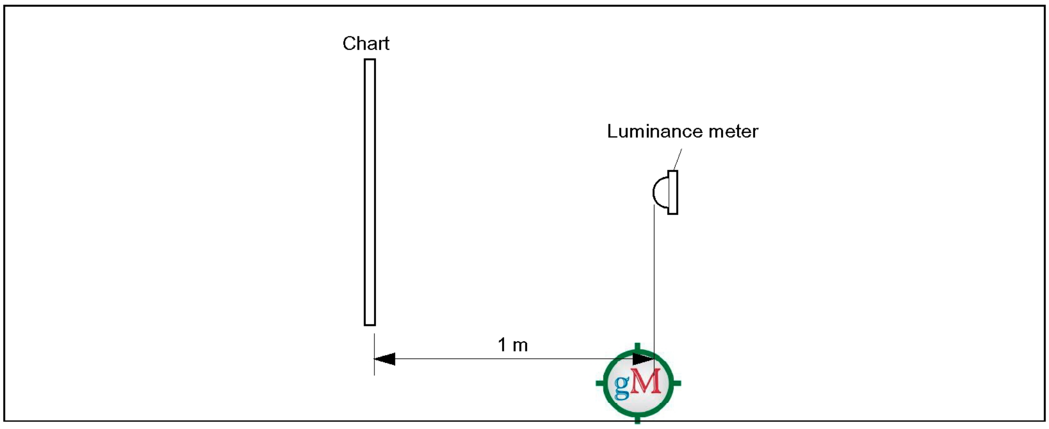
## Setting luminous intensity (when the transparent chart is used)

Equipment: Luminance meter (Minolta LS-110 or equivalent. Calibrated.)

1. Light the pattern box and warm up for about 30 minutes.
2. Place the pattern box where the chart is not exposed to light, such as a darkroom.
   (Or cover the pattern box with a cover whose inside is painted in black.)
3. Place the luminance meter facing straight to the chart at a distance of 1 m from it.
4. Adjust the luminance control of the pattern box so that the white portion in the center of the chart is 573 ±6 cd/m$^2$.

   **Note**

   This corresponds to the luminous intensity on the 89.9 %-reflective chart at 2000 lx.



## 5-1-5. Description on Setup Menu

A part of adjustments given in this section uses the setup menu. The setup menu consists of the following menus. Besides there is a TOP menu indicating the entire configuration of menu items.

- OPERATION menu
- PAINT menu
- MAINTENANCE menu
- FILE menu
- DIAGNOSIS menu

For details on the setup menu, refer to Section 4 of the maintenance manual part 1.

In this manual, describes the setup menu operation as follows.

For example:
When AUTO LEVEL in AUTO SETUP page of MAINTENACE menu is performed:

| | |
|---|---|
| MENU: | MAINTENANCE |
| PAGE: | AUTO SETUP |
| ITEM: | AUTO LEVEL |

---

### How to change the setting values

To enter or cancel the setting value of items, which can be changed by turning the rortary encoder, proceed as follows.

To enter the setting value;

Press the rortary encoder.

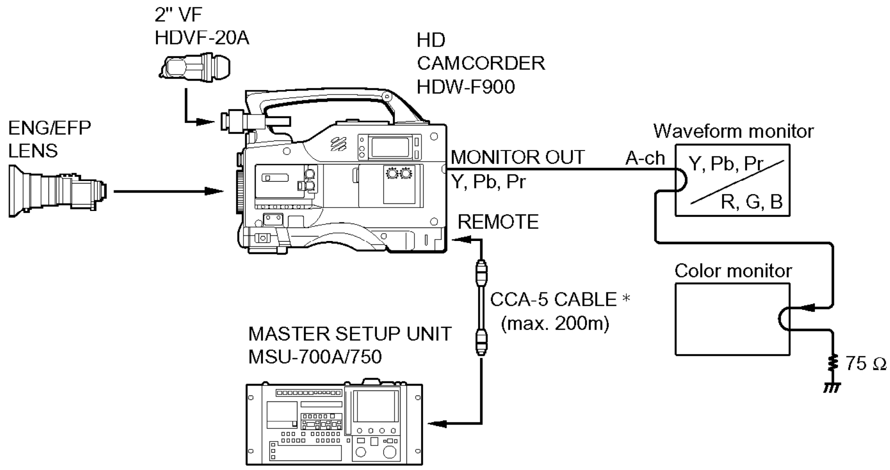
To cancel the setting value;

Before pressing the rortary encoder, press the MENU switch toward the “CANCEL” side. The original setting is restored.

After pressing the MENU SEL switch, the setting can not be canceled.

## 5-1-6. Connection of Equipment

### General Adjustments


2" VF
HDVF-20A
HD
CAMCORDER
HDW-F900
ENG/EFP
LENS
Waveform monitor
MONITOR OUT
Y, Pb, Pr
A-ch
Y, Pb, Pr
R, G, B
REMOTE
Color monitor
CCA-5 CABLE *
(max. 200m)
MASTER SETUP UNIT
MSU-700A/750
75 Ω

*: Required only when using MSU-700A/750.

## 5-1-7. Initial Settings

**Note**

In this section, describes the adjustment procedures using MSU-700A.

### MSU control panel

When MSU-700A is used

- Power supply and signal switching block
  ALL button → OFF (dark)
  CAM PW button → ON (Lit)
  VF PW button → ON (Lit)
  TEST 1 button → OFF (dark)
  TEST 2 button → OFF (dark)
  BARS button → OFF (dark)
  CLOSE button → ON (Lit)
- Camera/CCU circuit ON/OFF block
  KNEE OFF button → OFF (Lit)
  DETAIL OFF button → OFF (Lit)
  LVL DEP OFF button → OFF (Lit)
  MATRIX OFF button → OFF (Lit)
  AUTO KNEE button → OFF (dark)
  SKIN DETAIL button → OFF (dark)
- Others
  GAMMA OFF button → ON (dark)
  MASTER GAIN → 0 (0 dB)
  FILTER(ND) button → 1 (CLEAR)
  FILTER(CC) button → B (3200K)
  ECS/SHUTTER ON button → OFF (dark)

When MSU-750 is used

- Power supply and signal switching block
  ALL button → OFF (dark)
  CAM PW button → ON (Lit)
  VF PW button → ON (Lit)
  TEST button → OFF (dark)
  BARS button → OFF (dark)
  CLOSE button → ON (Lit)
- Camera/CCU circuit ON/OFF block
  Knee Off* → OFF (Lit in reverse)
  Detail Off* → OFF (Lit in reverse)
  Level Dep Off* → OFF (Lit in reverse)
  Matrix Off* → OFF (Lit in reverse)
  AUTO KNEE button → OFF (dark)
  SKIN DETAIL button → OFF (dark)
- Others
  Gamma Off* → ON (Lit normally)
  Master Gain* → 0 (0 dB)
  ND (1/2/3/4/5)* → 1 (CLEAR)
  CC (A/B/C/D/E)* → B (3200K)
  ECS/Shutter* → OFF (Lit normally)

*: Push the FUNCTION button, then select the function menu display.

### When adjusting using the Setup menu

Set S300-1 to S300-4 switches on the IF-819 board to OFF.

- OPERATION menu

| Page | Setting item | Initial setting |
|---|---|---|
| GAIN SW | LOW | 0 dB |
| | MIDDLE | 6 dB |
| | HIGH | 12 dB |

- PAINT menu

| Page | Setting item | Initial setting |
|---|---|---|
| VIDEO LEVEL | TEST | OFF |
| GAMMA | GAMMA | ON |
| KNEE | KNEE | OFF |
| | WHT CLIP | OFF |
| DETAIL 1 | DETAIL | ON |
| SKIN DETAIL | SKIN DTL | OFF |
| USER MATRIX | MATRIX | OFF |

### Side panel:

VTR SAVE/STBY switch → STBY
GAIN switch → L (0 dB)
OUTPUT/DCC switch → CAM/OFF
WHITE BAL switch → PRST

### Front panel:

SHUTTER switch → OFF
FILTER control → 1B (3200 K)

## 5-2. Automatic Adjustment

MAINTENANCE menu is used to perform the automatic adjustment.
(Refer to Section 4-5 of the maintenance manual part 1.)

### To execute the automatic adjustment

1. Set the setup menu as follows.
   MENU : MAINTENANCE
   PAGE : AUTO SETUP
   ITEM : AUTO LEVEL
2. Message “Completed” is displayed when the adjustment is completed.

# 5-3. PA-238 Board Adjustment

## 5-3-1. PA Balance Adjustment

Equipment: Oscilloscope
Object: Grayscale chart

### Preparation

Extend the VA-195 board with the extension board (EX-410).

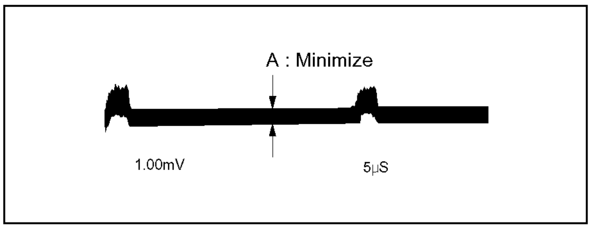
### Adjustment Procedures

1. Setting for MSU-700A
   CLOSE button → ON (lit)
2. Black balance adjustment
   Adjust levels for R, G and B as follows.

| | Test point/ EX-410 board | Adj. point/ PA-238 board |
|---|---|---|
| R-ch | TP98 | ⊘RV102 |
| G-ch | TP92 | ⊘RV202 |
| B-ch | TP86 | ⊘RV302 |

(GND: TP96, Trigger: TP67)

Specification: Minimize the level at A (width).

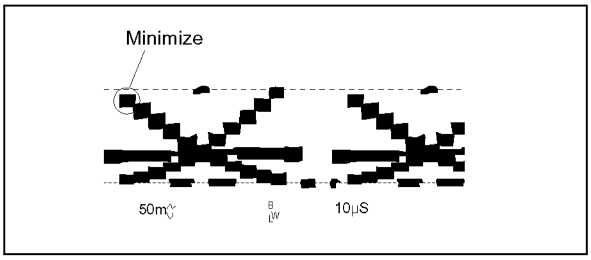


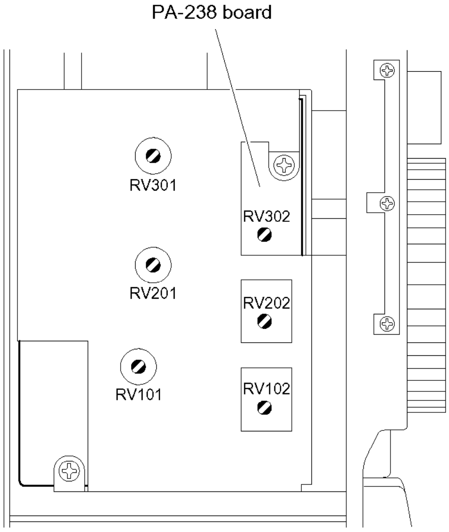
3. Setting for MSU-700A
   CLOSE button → ON (dark)
4. Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame (F10, 2000 lx, 3200 K).
5. White balance adjustment
   Adjust levels for R, G and B as follows.

| | Test point/ EX-410 board | Adj. point/ PA-238 board |
|---|---|---|
| R-ch | TP98 | ⊘RV101 |
| G-ch | TP92 | ⊘RV201 |
| B-ch | TP86 | ⊘RV301 |

(GND: TP96, Trigger: TP67)

Specification: Minimize the level (width) of the stepped part.





## 5-4. SH-74 Board Adjustment

### 5-4-1. VA Gain Adjustment

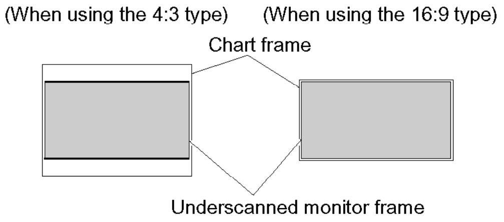
**Note**

For the VA gain adjustment, using an 89.9%-reflective grayscale chart is preferable.
Before beginning adjustment, be sure to set the illumination of the light source (or the lumirous intensity on the chart surface) and to set the color temperature exactly.
For details, refer to Section 5-1-4 “Maintaining the Grayscale Chart”

Eauipment : Oscilloscope
Object : Grayscale chart

#### Preparations

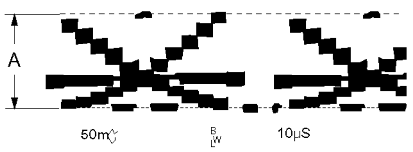
- Extend the VA-195 board with the extension board (EX-410).
- Shoot the grayscale chart as shown below. (F10, 2000 lx, 3200 K).


(When using the 4:3 type)
(When using the 16:9 type)
Chart frame
Underscanned monitor frame

- Setting for MSU-700A
  CLOSE button → OFF (dark)
  ECS/SHUTTER ON button → OFF (dark)

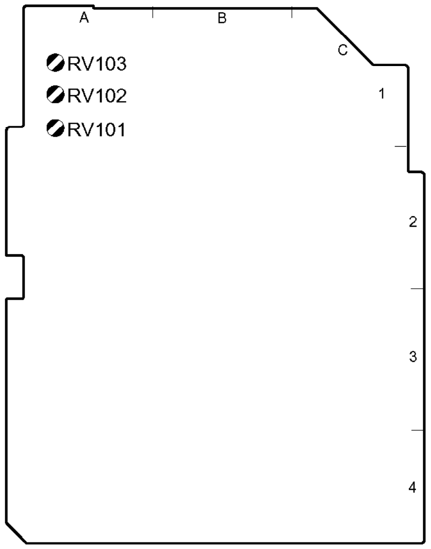
#### Adjustment Procedures

1. VA OUT R level adjustment
   Measuring point : TP95/EX-410 board
   Adjusting point : ⊘RV103/SH-74 board
   Specification : A = 400 ±4 mV
2. VA OUT G level adjustment
   Measuring point : TP89/EX-410 board
   Adjusting point : ⊘RV102/SH-74 board
   Specification : A = 400 ±4 mV
3. VA OUT B level adjustment
   Measuring point : TP83/EX-410 board
   Adjusting point : ⊘RV101/SH-74 board
   Specification : A = 400 ±4 mV



#### Setting After Adjustment

- After the adjustment, return the switches to their original settings.



SH-74 Board (A Side)

## 5-5. VDA-51 Board Adjustment

### 5-5-1. Character Level Adjustment

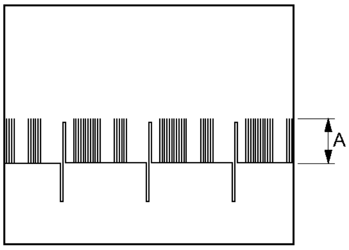
Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector

#### Preparations

- Extend the VDA-51 board with the extension board (EX-410).
- Setting for MSU-700A
  CLOSE button → ON (lit)
- DISPLAY switch/side panel → MENU

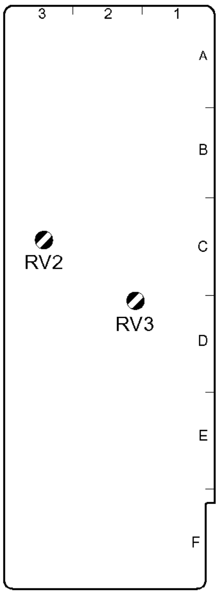
#### Adjustment Procedure

Adjustment Point: ⊘RV3/VDA-51 board
Specification: A = 266 ±10 mV



#### Resetting after Adjustment

- Return the switches to their previous positions.



VDA-51 Board (A Side)

### 5-5-2. VF RETURN Level Adjustment

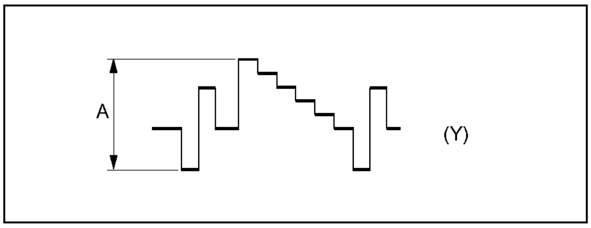
Equipment: Oscilloscope

#### Preparations

- Extend the VDA-51 board with the extension board (EX-410).
- Input the 1 V p-p color bar (Y signal) to the GENLOCK IN terminal.
- Menu setting:
  MENU: OPERATION
  PAGE: OTHERS
  ITEM: ASSIGNABLE 1 or ASSIGNABLE 2 → RETURN

#### Adjustment Procedure

1. While pressing the ASSIGNABLE switch 1 or 2 (side panel) set to RETURN at Preparations, adjust ⊘RV2 so that the specified value is satisfied.
   Test Point: TP35/EX-410 board
   Adjustment Point: ⊘RV2/VDA-51 board
   Specification: A = 1.00 ±0.05 V



## 5-6. DA-148 Board Adjustment

### 5-6-1. DA Gain Adjustment

Equipment: Waveform monitor (Y, Pb, Pr)
Test Point: MONITOR OUT connector

#### Preparation

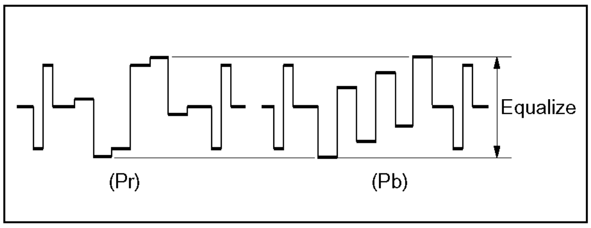
- Setting for MSU-700A
  BARS button → ON (lit)

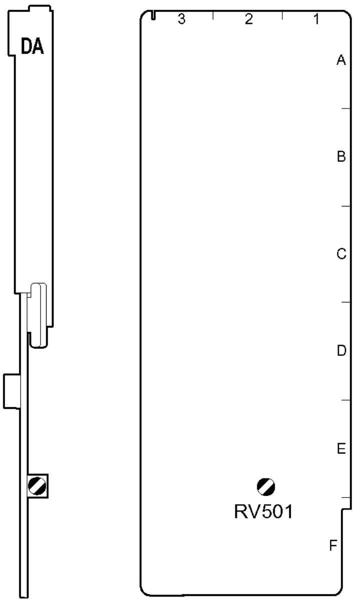
#### Adjustment Procedure

Adjustment Point: ⊘RV501/DA-148 board
Specification: Adjust the Pb level (⊘RV501) so that the Pb and Pr levels become equal.

**Reference**

To adjust the Pb and Pr levels together, or to adjust the Y level, use the OTHERS 1 page on the MAINTENANCE menu.





DA-148 Board (A Side)

## 5-7. Video System Level Adjustment (When using the Setup Menu)

**Notes**

- This section describes the adjusting procedure using the setup menu.
  Refer to Section 5-8 when adjusting using MSU-700A/750.
- Perform the following adjustments (Sections 5-7-1 to 5-7-12) at the request of the customer.

### 5-7-1. White Shading Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Full white pattern

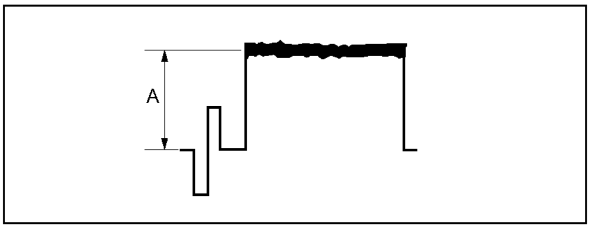
#### Note

When performing the white shading adjustment, make sure the following conditions are proper. If not, adjustment can not be complete.

- White pattern is not uneven.
- Luminance is correctly adjusted.
- Iris and zoom control of the lens are correctly adjusted.

#### Preparations

- Menu setting:
  MENU: PAINT
  PAGE: SW STATUS
  ITEM: KNEE → OFF
- Shoot the fully occupied white area of the white pattern on the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV (at F4 to F5.6)
  (If a lens aperture is greater than F5.6, adjust the light amounts with shutter.)



- Lens Focus: ∞
- Lens Extender/Shrinker: ×2, ×0.8 → OFF

- Call the file in accordance with the lens attached.
  Menu setting:
  MENU: FILE
  PAGE: LENS FILE
  ITEM: FILE No.

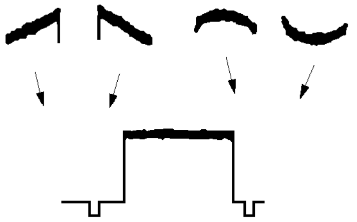
  **Note**

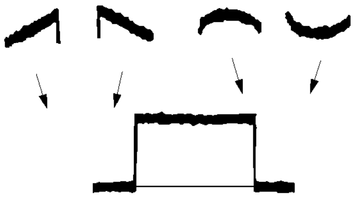
  If no corresponding file exists, select the file number whose FILE NAME is displayed as NO OFFSET, and change the lens name.

  Menu setting:
  MENU: FILE
  PAGE: LENS FILE
  ITEM: FILE NAME

## Adjustment Procedures

1. Adjust the white balance.
   AUTO W/B BAL switch (front panel) → WHT
2. Select the R signal output on the waveform monitor.
   If the white shading is monitored, make the waveform flat referring to the following tables.

| | Output signal of waveform monitor | H SAW<br>MENU: MAINTENANCE<br>PAGE:<br>WHITE SHADING | H PARA<br>MENU: MAINTENANCE<br>PAGE:<br>WHITE SHADING |
|---|---|---|---|
| R | R | ITEM: H SAW (R) | ITEM: H PARA (R) |
| G | G | ITEM: H SAW (G) | ITEM: H PARA (G) |
| B | B | ITEM: H SAW (B) | ITEM: H PARA (B) |
| MONITOR OUT connector | |  | |

| | Output signal of waveform monitor | V SAW<br>MENU: MAINTENANCE<br>PAGE:<br>WHITE SHADING | V PARA<br>MENU: MAINTENANCE<br>PAGE:<br>WHITE SHADING |
|---|---|---|---|
| R | R | ITEM: V SAW (R) | ITEM: V PARA (R) |
| G | G | ITEM: V SAW (G) | ITEM: V PARA (G) |
| B | B | ITEM: V SAW (B) | ITEM: V PARA (B) |
| MONITOR OUT connector | |  | |

3. Perform the adjustments for G-ch and B-ch with the same procedures as for R-ch.
4. Adjust the white balance.
   AUTO W/B BAL switch (front panel) → WHT

## Lens File Store

Menu setting:
MENU: FILE
PAGE: LENS FILE
ITEM: STORE FILE

Specify the file number to be saved, and execute FILE STORE.

### Adjustment for Lens Extender/Shrinker

When using the lens extender or lens shrinker, perform the following adjustments after the completion of lens file store.

#### Using the lens extender

5. Set the setup menu as follows.
   - Call the file in accordance with the lens attached.
     Menu setting:
     MENU: FILE
     PAGE: LENS FILE
     ITEM: FILE No.

     **Note**

     If no corresponding file exists, select the file number whose FILE NAME is displayed as NO OFFSET, and change the lens name.
     Menu setting:
     MENU: FILE
     PAGE: LENS FILE
     ITEM: FILE NAME
6. Lens extender (×2) → ON
7. Perform procedures 2 to 4, then perform the lens file store again.
8. Lens extender (×2) → OFF

#### Using the lens shrinker

9. Set the setup menu as follows.
   - Call the file in accordance with the lens attached.
     Menu setting:
     MENU: FILE
     PAGE: LENS FILE
     ITEM: FILE No.

     **Note**

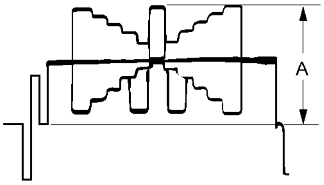
     If no corresponding file exists, select the file number whose FILE NAME is displayed as NO OFFSET, and change the lens name.
     Menu setting:
     MENU: FILE
     PAGE: LENS FILE
     ITEM: FILE NAME
10. Lens shrinker (×0.8) → ON
11. Perform procedures 2 to 4, then perform the lens file store again.
12. Lens shrinker (×0.8) → OFF

## 5-7-2. H/V Ratio Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

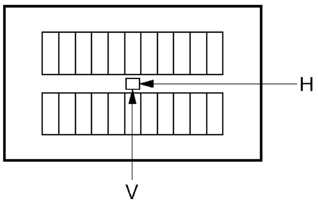
### Preparations

- Menu setting:
  MENU: PAINT
  PAGE: KNEE
  ITEM: KNEE → OFF
  PAGE: DETAIL 1
  ITEM: DETAIL → ON
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedures

1. Menu setting:
   MENU: PAINT
   PAGE: DETAIL 1
   ITEM: LEVEL → 99
   ITEM: LIMITER [M] → 0
   ITEM: CRISP → −25
   ITEM: LVL DEP → 25
2. Adjustment item:
   MENU: PAINT
   PAGE: DETAIL 1
   ITEM: HV RATIO
   Specification: A ratio between H and D detail amounts (white) to be added shall be equal. (from 20 to 40)



## 5-7-3. Detail Level Adjustment

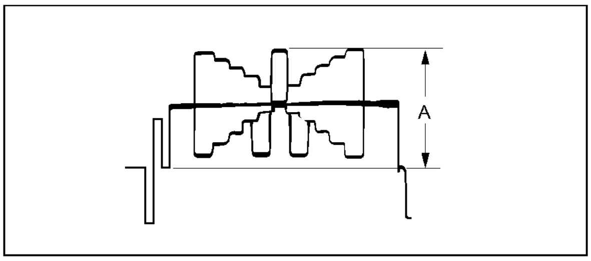
Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

- Menu setting:

| | |
|---|---|
| MENU: | PAINT |
| PAGE: | KNEE |
| ITEM: | KNEE → OFF |
| PAGE: | DETAIL 1 |
| ITEM: | DETAIL → ON |

- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedure

Adjustment item:

| | |
|---|---|
| MENU: | PAINT |
| PAGE: | DETAIL 1 |
| ITEM: | LEVEL |
| Specification: | Adjust the detail level to be added to each step of the grayscale for the desired level. |

## 5-7-4. Crispening Adjustment

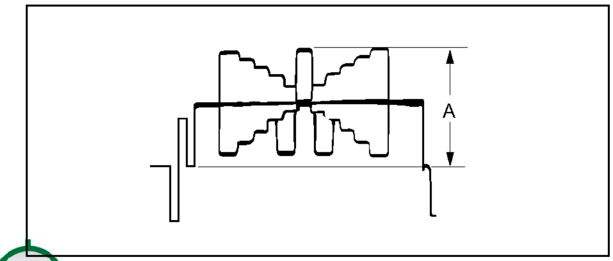
Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

- Menu setting:

| | |
|---|---|
| MENU: | PAINT |
| PAGE: | DETAIL 1 |
| ITEM: | DETAIL → ON |

- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedures

1. Adjust the white balance.
   AUTO W/B BAL switch (front panel) → WHT
2. Adjust the crispening level.
   Adjustment item:

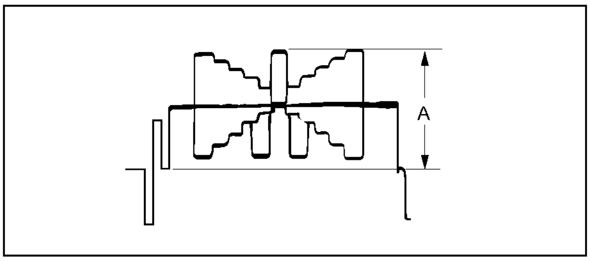
| | |
|---|---|
| MENU: | PAINT |
| PAGE: | DETAIL 1 |
| ITEM: | CRISP |
| Specification: | Set Crispening to −99 once. And turn slowly for increment until the noise at the black level of the waveform is just decreased, or until an appropriate crispening level is obtained. |

## 5-7-5. Level Dependent Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

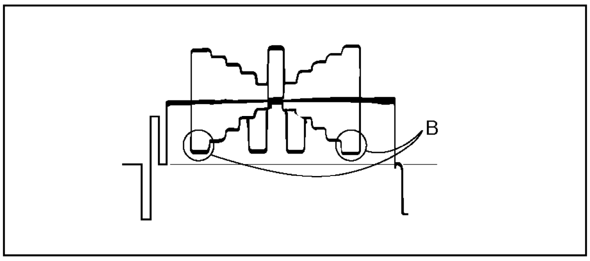
### Preparations

- Menu setting:
  MENU: PAINT
  PAGE: DETAIL 1
  ITEM: DETAIL → ON
  ITEM: LVL DEP → ON
  **Reference**
  There are two LVL DEP items on the DETAIL 1 page.
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedure

Adjustment item:
MENU: PAINT
PAGE: DETAIL 1
ITEM: LVL DEP
Specification: Set Level Dep to −99 once. And turn slowly for increment until spikes at portions B just decreased.



### Note

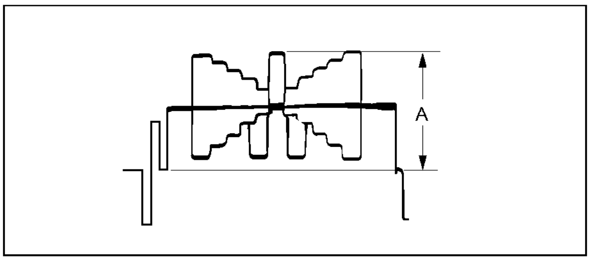
After adjustment is complete, be sure to perform Section 5-7-2 “H/V Ratio Adjustment”.

## 5-7-6. Detail Clip Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

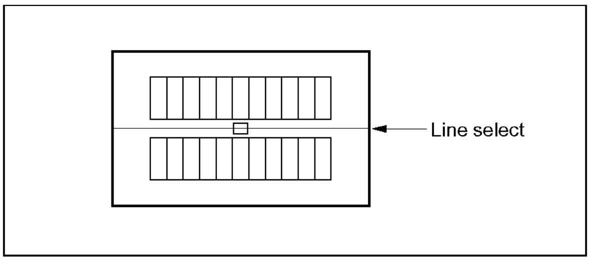
### Preparations

- Menu setting:
  MENU: PAINT
  PAGE: KNEE
  ITEM: KNEE → OFF
  PAGE: DETAIL 1
  ITEM: DETAIL → ON
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV

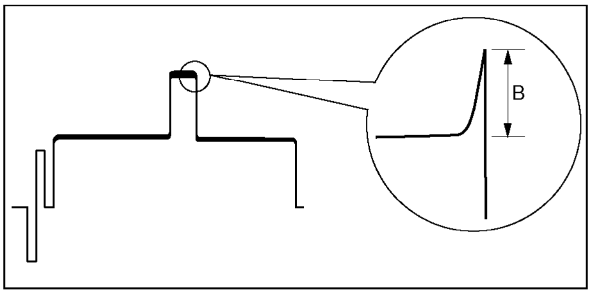


### Adjustment Procedures

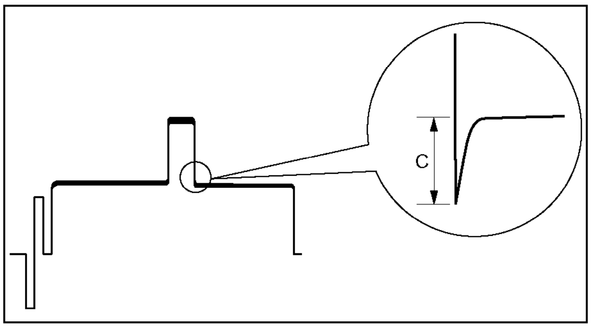
1. Adjust the white balance.
   AUTO W/B BAL switch (front panel) → WHT
2. Make a lines selection at the center white portion of the grayscale chart.



3. Adjust the white limiter.
   Adjustment item:
   MENU: PAINT
   PAGE: DETAIL 1
   ITEM: LIMITER WHT
   Specification: Adjust the edges at portion B for the desired clip level.



4. Adjust the black limiter.
   Adjustment item:
   MENU: PAINT
   PAGE: DETAIL 1
   ITEM: LIMITER BLK
   Specification: Adjust the edges at portion C for the desired clip level.



### 5-7-7. Auto-iris Adjustment

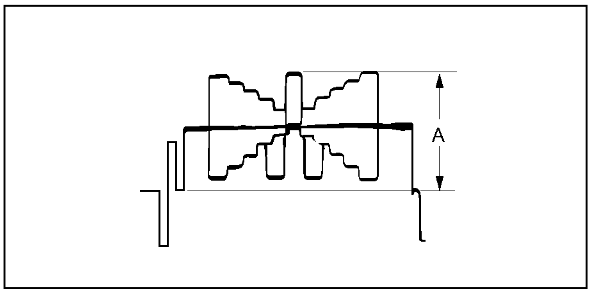
Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

#### Preparations

- Iris of the lens → AUTO
  Menu setting:
  MENU: PAINT
  PAGE: SW STATUS
  ITEM: KNEE → OFF
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.

#### Adjustment Procedures

1. Adjust the white balance.
   AUTO W/B BAL switch (front panel) → WHT
2. Adjust APL ratio.
   Adjustment item:
   MENU: MAINTENANCE
   PAGE: AUTO IRIS
   ITEM: APL RATIO
   Specification: Adjust to determine if the feedback is to be applied according to the peak luminance of the object or the average luminance. The higher you set the value, the feedback depends more on the average luminance.
3. Adjust the convergence target of the auto-iris-Adjustment.
   Adjustment item:
   MENU: MAINTENANCE
   PAGE: AUTO IRIS
   ITEM: IRIS LEVEL
   Specification: A = 700 ±7 mV



## 5-7-8. Pedestal Level Adjustment

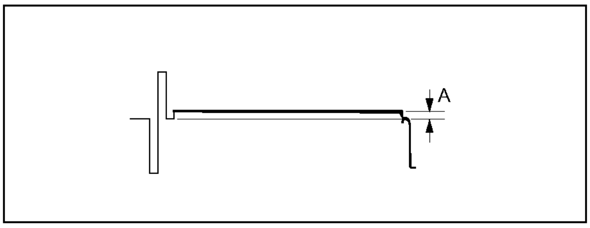
Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector

### Preparations

- Iris of the lens → CLOSE

### Adjustment Procedures

1. Adjustment item:
   MENU: PAINT
   PAGE: VIDEO LEVEL
   ITEM: BLACK
   Specification: Adjust the levels A for preferred level for R, G and B respectively. In case of all levels for R, G and B adjust simultaneously, adjust its using the Master. (Reference value: A = 21 mV)

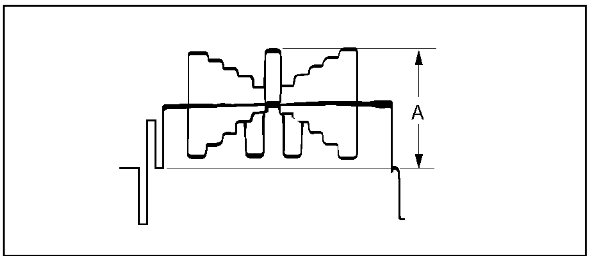


## 5-7-9. Flare Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

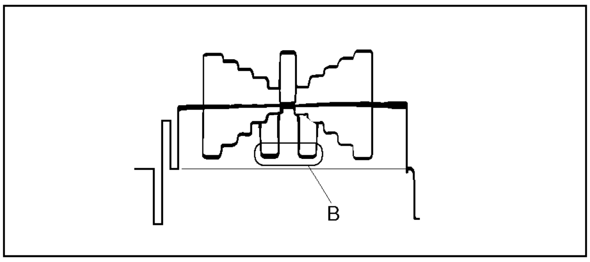
### Preparations

- Menu setting:
  MENU: PAINT
  PAGE: KNEE
  ITEM: KNEE → OFF
  PAGE: DETAIL 1
  ITEM: DETAIL → OFF
  PAGE: USER MATRIX
  ITEM: MATRIX → OFF
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedures

1. Adjustment item:
   MENU PAINT
   PAGE: VIDEO LEVEL
   ITEM: FLARE
   Specification: Adjust the levels B for preferred level for R, G and B respectively.

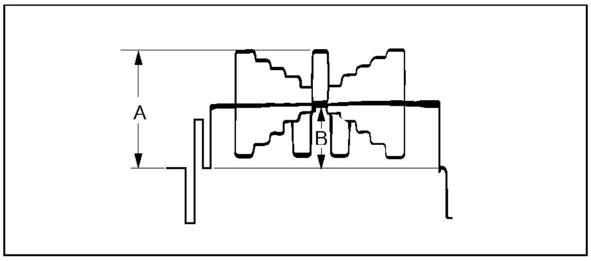


## 5-7-10. Gamma Correction Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

- Menu setting:
  MENU: PAINT
  PAGE: SW STATUS
  ITEM: KNEE → OFF
  ITEM: GAMMA → OFF
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 700 ±20 mV



### Adjustment Procedures

1. Adjust the white balance.
   AUTO W/B BAL switch (front panel) → WHT
2. Adjustment item:
   MENU: PAINT
   PAGE: GAMMA
   ITEM: LEVEL
   Specification: Adjust the cross points B of the gray scale for preferred level for R, G and B respectively.
   In case of all cross points for R, G and B adjust simultaneously, adjust its using the Master.

## 5-7-11. Knee Point/Knee Slope Adjustment

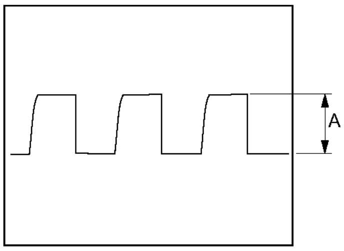
Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector

### Preparations

- GAIN switch (side panel) → M (+6 dB)
- Menu setting:
  MENU: PAINT
  PAGE: KNEE
  ITEM: KNEE → ON
  ITEM: TEST → 1

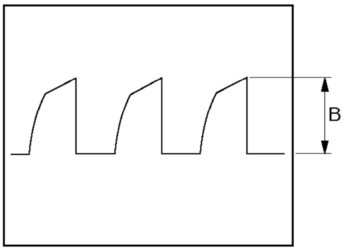
### Adjustment Procedures

1. Adjustment item:
   MENU: PAINT
   PAGE: KNEE
   ITEM: SLOPE M → +99
2. Adjustment item:
   MENU: PAINT
   PAGE: KNEE
   ITEM: POINT
   Specification: Adjust the levels A for preferred level for R, G and B respectively.
   In case of all levels for R, G and B adjust simultaneously, adjust its using the Master.
   (Reference value: A = 686 mV)



3. Adjustment item:

| | |
|---|---|
| MENU: | PAINT |
| PAGE: | KNEE |
| ITEM: | SLOPE |
| Specification: | Adjust the cross points B of the gray scale for preferred level for R, G and B respectively.<br>In case of all cross points for R, G and B adjust simultaneously, adjust its using the Master.<br>(Reference value: B = 735 mV) |



### Resetting after Adjustment

- GAIN switch (side panel) → L (0 dB)
- Menu setting:

| | |
|---|---|
| MENU: | PAINT |
| PAGE: | SW STATUS |
| ITEM: | KNEE → OFF |

## 5-7-12. White Clip Level Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector

### Preparations

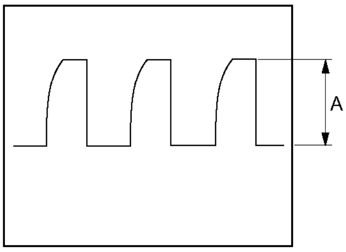
- GAIN switch (side panel) → H (+12 dB)
- Menu setting:

| | |
|---|---|
| MENU: | PAINT |
| PAGE: | KNEE |
| ITEM: | TEST → 1 |

### Adjustment Procedures

1. Adjustment item:

| | |
|---|---|
| MENU: | PAINT |
| PAGE: | KNEE |
| ITEM: | WHT CLP |
| Specification: | Adjust the levels A for preferred level for R, G and B respectively.<br>In case of all levels for R, G and B adjust simultaneously, adjust its using the Master.<br>(Reference value: A = 756 mV) |



### Resetting after Adjustment

- GAIN switch (side panel) → L (0 dB)
- Menu setting:

| | |
|---|---|
| MENU: | PAINT |
| PAGE: | KNEE |
| ITEM: | TEST → OFF |

### 5-7-13. File Store

After adjustments described in Section 5-7 are complete, be sure to execute the reference file store.

| | |
|---|---|
| MENU: | FILE |
| PAGE: | REFERENCE |
| ITEM: | STORE FILE |

## 5-8. Video System Level Adjustment (When using MSU)

**Notes**

- This section describes the adjusting procedure using the master setup unit MSU-700A.
  Refer to Section 5-7 when using the setup menu.
- Perform the following adjustments (Sections 5-8-1 to 5-8-12) at the request of the customer.

### 5-8-1. White Shading Adjustment

| | |
|---|---|
| Equipment: | Waveform monitor (R, G, B) |
| Test Point: | MONITOR OUT connector |
| Object: | Full white pattern |

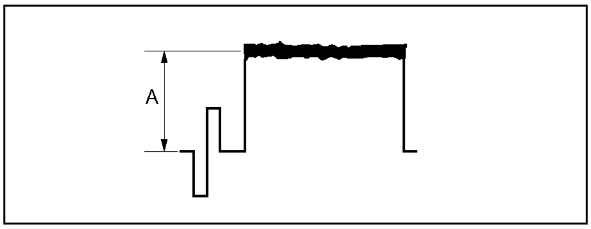
**Note**

When performing the white shading adjustment, make sure the following conditions are proper. If not, adjustment can not be complete.

- White pattern is not uneven.
- Luminance is correctly adjusted.
- Iris and zoom control of the lens are correctly adjusted.

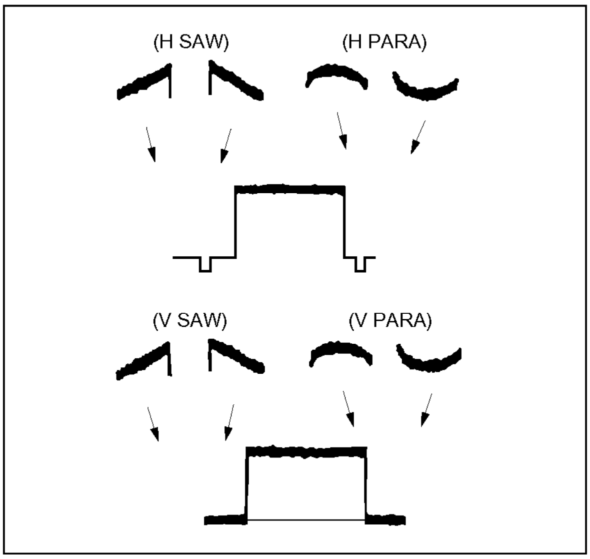
**Preparations**

- Setting for MSU-700A
  KNEE OFF button → OFF (lit)
- Shoot the fully occupied white area of the white pattern on the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV (at F4 to F5.6)
  (If a lens aperture is greater than F5.6, adjust the light amounts with shutter.)
- Lens Focus: ∞
- Lens Extender/Shrinker: ×2, ×0.8 → OFF
- Set the setup menu as follows.
  MENU: OPERATION
  PAGE: LENS FILE
  ITEM: FILE
  (Select the file in accordance with the lens attached. If there is no appropriate file, select NO OFFSET, then change the name of lens with MSU.)



## Adjustment Procedures

1. Adjust the white balance.
   WHITE button/MSU-700A → ON (lit)
2. If the shading is monitored, proceed as follows
   **MSU menu operation:**
   - MAINTENANCE button → ON (lit)
   - Touch panel operation
     Adjusting → White Shading → R
   - Adjustment Items: H Saw, H Para, V Saw, V Para



3. Adjust for G-ch in the same manner.
4. Adjust for B-ch in the same manner.
5. Adjust the white balance.
   WHITE button/MSU-700A → ON (lit)

## Lens File Store

### MSU menu operation:

- FILE button → ON (lit)
- Touch panel operation
  Lens File → Lens Store → Store

## Adjustment for Lens Extender/Shrinker

When using the lens extender or lens shrinker, perform the following adjustments after the completion of lens file store.

### Using the lens extender

6. Set the setup menu as follows.
   MENU: OPERATION
   PAGE: LENS FILE
   ITEM: FILE
   (Select the file in accordance with the lens attached. If there is no appropriate file, select NO OFFSET, then change the name of lens with MSU.)
7. Lens extender (×2) → ON
8. Perform procedures 2 to 5, then perform the lens file store again.
9. Lens extender (×2) → OFF

### Using the lens shrinker

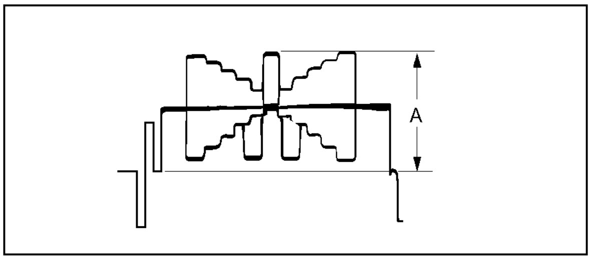
10. Set the setup menu as follows.
    MENU: OPERATION
    PAGE: LENS FILE
    ITEM: FILE
    (Select the file in accordance with the lens attached. If there is no appropriate file, select NO OFFSET, then change the name of lens with MSU.)
11. Lens shrinker (×0.8) → ON
12. Perform procedures 2 to 5, then perform the lens file store again.
13. Lens shrinker (×0.8) → OFF

## 5-8-2. H/V Ratio Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

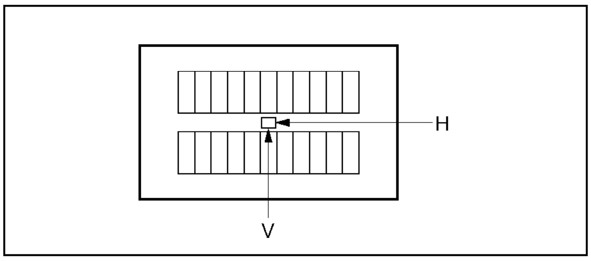
- Setting for MSU-700A
  DETAIL OFF button → ON (dark)
  KNEE OFF button → OFF (lit)
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedures

1. **MSU menu operation:**
   - PAINT button → ON (lit)
   - Touch panel operation
     (Page 1/3) → Detail → Detail 1
   - Set each item as follows.
     Level → 99
     Limiter → 0
     Crispening → −25
     Level Dep → 25
2. **MSU menu operation:**
   - Touch panel operation
     Detail 2

   Adjustment Item: H/V Ratio
   Specification: A ratio between H and D detail amounts (white) to be added shall be equal. (from 20 to 40)

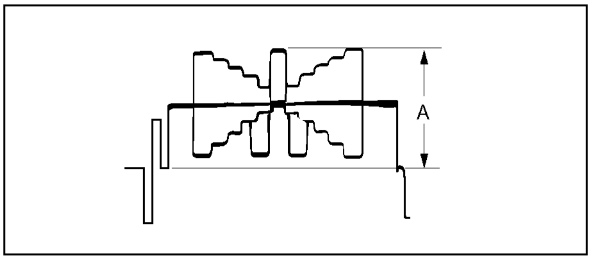


## 5-8-3. Detail Level Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

- Setting for MSU-700A
  DETAIL OFF button → ON (dark)
  KNEE OFF button → OFF (lit)
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedure

**MSU menu operation:**
- PAINT button → ON (lit)
- Touch panel operation
  (Page 1/3) → Detail → Detail 1

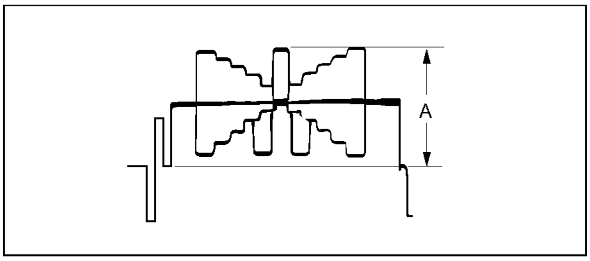
Adjustment Item: Level
Specification: Adjust the detail level to be added to each step of the grayscale for the desired level.

## 5-8-4. Crispening Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

- Setting for MSU-700A
  DETAIL OFF button → ON (dark)
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedures

1. Adjust the white balance.
   WHITE button/MSU-700A → ON (lit)
2. Adjust the crispening level.
   **MSU menu operation:**
   - PAINT button → ON (lit)
   - Touch panel operation
     (Page 1/3) → Detail → Detail 1

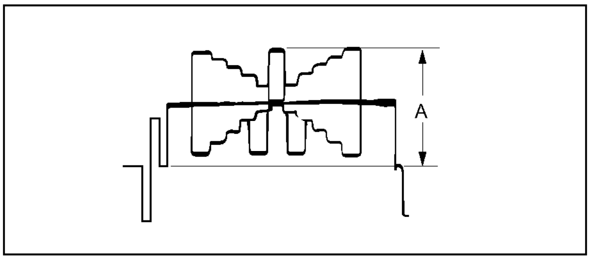
   Adjustment Item: Crispening
   Specification: Set Crispening to −99 once. And turn slowly for increment until the noise at the black level of the waveform is just decreased, or until an appropriate crispening level is obtained.

## 5-8-5. Level Dependent Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

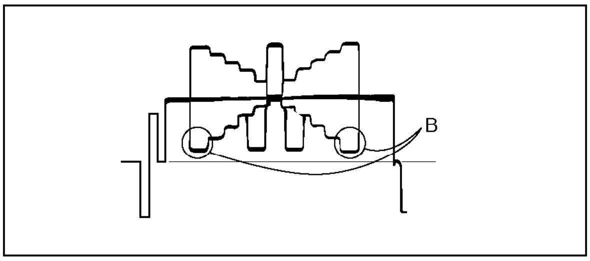
- Setting for MSU-700A
  DETAIL OFF button → ON (dark)
  LEVEL DEP OFF button → ON (dark)
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedure

**MSU menu operation:**
- PAINT button → ON (lit)
- Touch panel operation
  (Page 1/3) → Detail → Detail 1

Adjustment Item: Level Dep
Specification: Set Level Dep to −99 once. And turn slowly for increment until spikes at portions B just decreased.



### Note

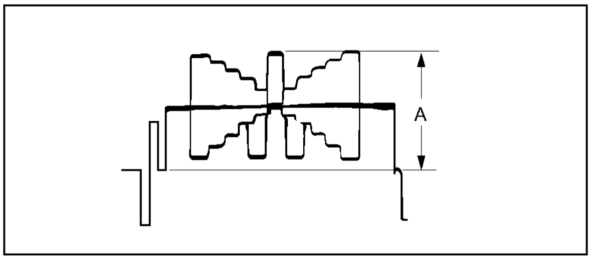
After adjustment is complete, be sure to perform Section 5-8-2 “H/V Ratio Adjustment”.

## 5-8-6. Detail Clip Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

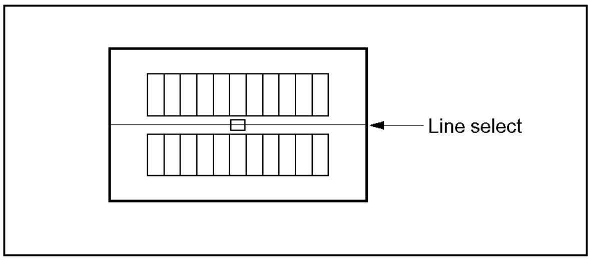
### Preparations

- Setting for MSU-700A
  KNEE OFF button → OFF (lit)
  DETAIL OFF button → ON (dark)
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 600 ±20 mV



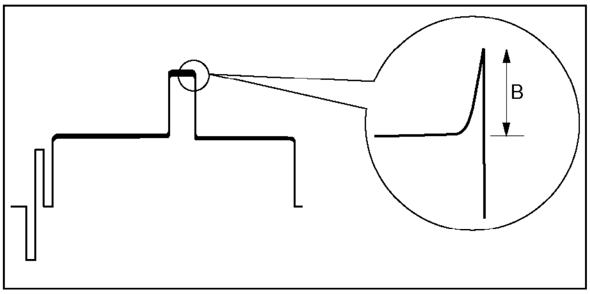
### Adjustment Procedures

1. Adjust the white balance.
   WHITE button/MSU-700A → ON (lit)
2. Make a lines selection at the center white portion of the grayscale chart.



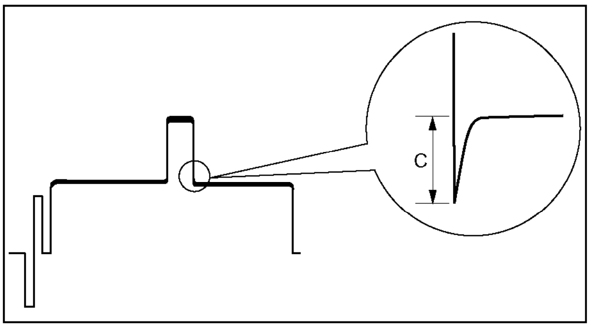
3. Adjust the white limiter.
   **MSU menu operation:**
   - PAINT button → ON (lit)
   - Touch panel operation
     (Page 1/3) → Detail → Detail 3

   Adjustment Item: W.Limiter
   Specification: Adjust the edges at portion B for the desired clip level.



4. Adjust the black limiter.
   **MSU menu operation:**
   - PAINT button → ON (lit)
   - Touch panel operation
     (Page 1/3) → Detail → Detail 3

   Adjustment Item: B.Limiter
   Specification: Adjust the edges at portion C for the desired clip level.



## 5-8-7. Auto-iris Adjustment

| | |
|---|---|
| Equipment: | Waveform monitor (R, G, B) |
| Test Point: | MONITOR OUT connector |
| Object: | Grayscale chart |

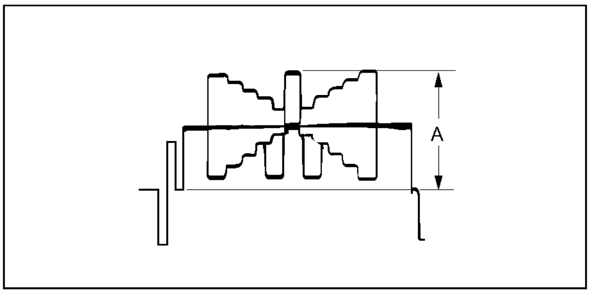
### Preparations

- Setting for MSU-700A
  AUTO button (Iris control block) → ON (lit)
  KNEE OFF button → OFF (lit)
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.

### Adjustment Procedures

1. Adjust the white balance.
   WHITE button/MSU-700A → ON (lit)
2. Adjust APL ratio.
   **MSU menu operation:**
   - MAINTENANCE button → ON (lit)
   - Touch panel operation
     Lens Adjusting → Auto Iris

   Adjustment Item: APL Ratio
   Specification: Adjust to determine if the feedback is to be applied according to the peak luminance of the object or the average luminance. The higher you set the value, the feedback depends more on the average luminance.
3. Adjust the convergence target of the auto-iris-Adjustment
   **MSU menu operation:**
   Adjustment Item: Level
   Specification: A = 700 ± 7 mV



## 5-8-8. Pedestal Level Adjustment

| | |
|---|---|
| Equipment: | Waveform monitor (R, G, B) |
| Test Point: | MONITOR OUT connector |

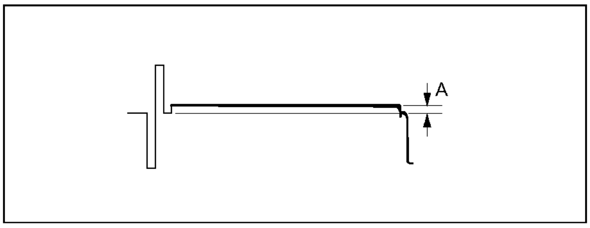
### Preparations

- Settings for MSU-700A
  CLOSE button → ON (lit)

### Adjustment Procedures

1. **MSU menu operation:**
   - PAINT button → ON (lit)
   - Touch panel operation
     (Page 1/3) → Black

   Adjustment Item: R, G, B Master
   Specification: Adjust the levels A for preferred level for R, G and B respectively. In case of all levels for R, G and B adjust simultaneously, adjust its using the Master.
   (Reference value: A = 21 mV)

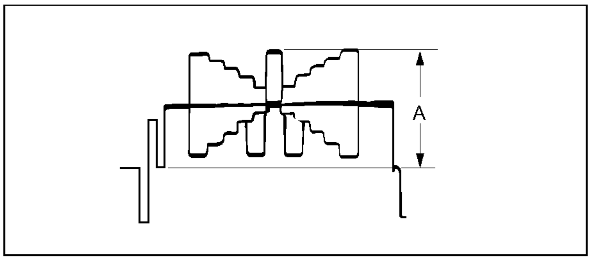


## 5-8-9. Flare Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

- Setting for MSU-700A
  KNEE OFF button → OFF (lit)
  DETAIL OFF button → OFF (lit)
  MATRIX OFF button → OFF (lit)
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.

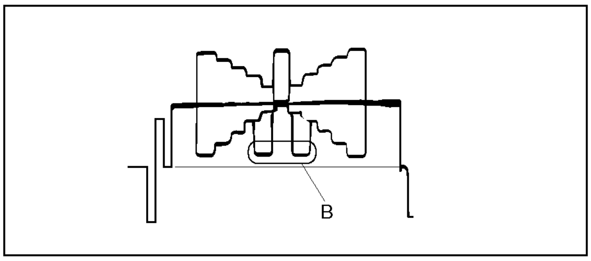


- Iris of the lens: A = 600 ±20 mV

### Adjustment Procedures

1. **MSU menu operation:**
   - PAINT button → ON (lit)
   - Touch panel operation
     (Page 1/3) → Flare

   Adjustment Item: R, G, B
   Specification: Adjust the levels B for preferred level for R, G and B respectively.

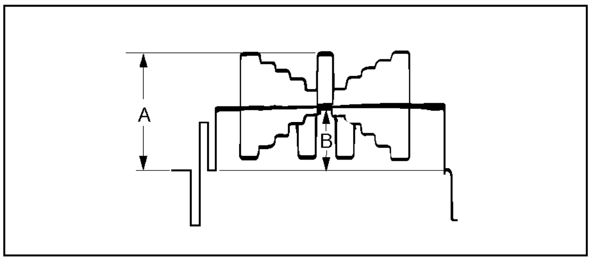


## 5-8-10. Gamma Correction Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

- Setting for MSU-700A
  KNEE OFF button → OFF (lit)
  GAMMA OFF button → ON (Not lit)
- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Iris of the lens: A = 700 ±20 mV



### Adjustment Procedures

1. Adjust the white balance.
   WHITE button/MSU-700A → ON (lit)
2. **MSU menu operation:**
   - PAINT button → ON (lit)
   - Touch panel operation
     (Page 2/3) → Gamma

   Adjustment Item: R, G, B, Master
   Specification: Adjust the cross points B of the gray scale for preferred level for R, G and B respectively.
   In case of all cross points for R, G and B adjust simultaneously, adjust its using the Master.

## 5-8-11. Knee Point/Knee Slope Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector

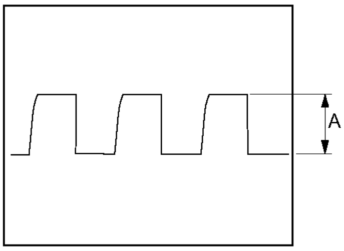
### Preparations

- Setting for MSU-700A
  MASTER GAIN → +6 dB
  TEST1 button → ON (lit)
  KNEE OFF button → ON (dark)

### Adjustment Procedures

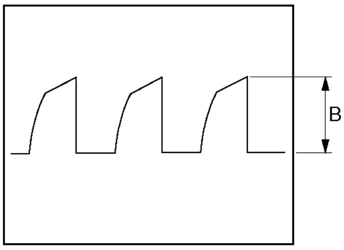
1. **MSU menu operation:**
   - PAINT button → ON (lit)
   - Touch panel operation
     (Page 2/3) → Knee Slope
   - Set Master to +99.
2. **MSU menu operation:**
   - Touch panel operation
     (Page 2/3) → Knee Point

   Adjustment Item: R, G, B Master
   Specification: Adjust the levels A for preferred level for R, G and B respectively. In case of all levels for R, G and B adjust simultaneously, adjust its using the Master.
   (Reference value: A = 686 mV)



3. **MSU menu operation:**
   - Touch panel operation
     (Page 2/3) → Knee Slope

   Adjustment Item: R, G, B Master
   Specification: Adjust the cross points B of the gray scale for preferred level for R, G and B respectively. In case of all cross points for R, G and B adjust simultaneously, adjust its using the Master.
   (Reference value: B = 735 mV)



### Resetting after Adjustment

- MASTER GAIN/MSU-700A → 0 dB
- KNEE OFF button/MSU-700A → OFF (lit)

## 5-8-12. White Clip Level Adjustment

Equipment: Waveform monitor (R, G, B)
Test Point: MONITOR OUT connector

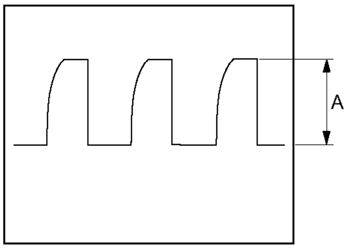
### Preparations

- Setting for MSU-700A
  MASTER GAIN → +12 dB
  TEST1 button → ON (lit)

### Adjustment Procedures

1. **MSU menu operation:**
   - PAINT button → ON (lit)
   - Touch panel operation
     (Page 2/3) → White Clip

   Adjustment Item: R, G, B Master
   Specification: Adjust the levels A for preferred level for R, G and B respectively. In case of all levels for R, G and B adjust simultaneously, adjust its using the Master.
   (Reference value: A = 756 mV)



### Resetting after Adjustment

- MASTER GAIN/MSU-700A → 0 dB
- TEST1 button/MSU-700A → OFF (dark)

## 5-8-13. File Store

After adjustments described in Section 5-8 are complete, be sure to execute the reference file store.

1. **MSU menu operation:**
   - FILE button → ON (lit)
   - Touch panel operation
     Reference → Ref Store → Start
2. When the store operation is complete, the message “Completed” is displayed.

http://getMANUAL.com

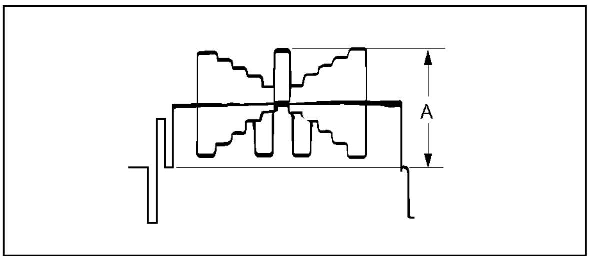
## 5-9. Adjustment After Replacement of ND Filter

When the filter disk unit or the ND filter alone in the filter disk unit is replaced, the correction of white balance is required. Proceed as follows.

Equipment: Waveform monitor (R, G, B)
Test point: MONITOR OUT connector
Object: Grayscale chart

### Preparations

- Shoot the grayscale chart so that the chart frame is aligned with the underscanned monitor frame.
- Setting for MSU-700A
  AUTO button (Iris control block) → ON (lit)
- Iris of the lens: A = 600 ±20 mV



### Adjustment Procedures

1. FILTER CTRL button/MSU-700A → ON (lit)
2. Select the ND 1 filter.
   ND 1 button/MSU-700A → ON (lit)
3. Adjust the white balance.
   WHITE button/MSU-700A → ON (lit)
4. After the white balance adjustment is complete, switch the filter from ND 1 to ND 2 and adjust the white balance for the ND 2 filter.
5. Switch the filter from ND2 to ND3 to ND4, and adjust the white balance for each.
   Set the GAIN for each ND filter as follows.
   MASTER GAIN/MSU-700A
   - ND filter 2: 6 dB
   - ND filter 3: 12 dB
   - ND filter 4: 18 dB

### OHB File Store

1. **MSU menu operation:**
   - FILE button → ON (lit)
   - Touch panel operation
     OHB File → OHB Store → Store
2. When the store operation is complete, the message "OHB File Stored" is displayed.

### Resetting after Adjustment

- MASTER GAIN/MSU-700A → 0 dB

# Section 6
# VTR System Electrical Alignment

## 6-1. General Precautions in Electrical Adjustments

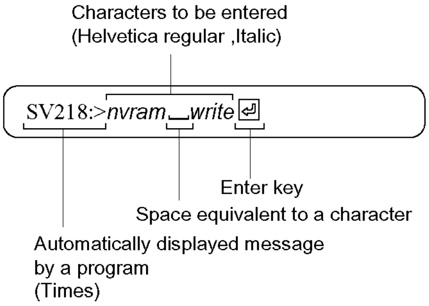
Turn ON the main power switch (external) before adjusting, and warm up the board for about 10 minutes with the VTR switch set to “SAVE”.

### Setting of Format

In this section, there are some adjustment items which need to adjust by switching the format.
As for the switching method of format, refer to the MULTI FORMAT page of the MAINTENANCE menu. (Refer to Section 4-5 of the maintenance manual part 1.)
Perform the adjustment in 59.94I format unless otherwise the mode specified.

### Representation of Personal Computer

The notation of the operation using the personal computer such as message that is automatically displayed on the screen by the program, and entered character and key using the keyboard of the PC are represented as follow.



```
SV218:>nvram write
```

Characters to be entered
(Helvetica regular ,Italic)
Enter key
Space equivalent to a character
Automatically displayed message
by a program
(Times)

## 6-2. Equipment/Tools Used

| Measuring Instruments/Tools | Model or Equivalent | Remarks |
|---|---|---|
| AC adapter or battery | Sony AC-550/BP-L60A | |
| Oscilloscope | Tektronix 2465B | |
| Audio analyzer | Tektronix AA501A (OP.02) | |
| Waveform monitor/vector scope | Leader electronic LV5150D | |
| Digital voltmeter | Advantest TR6845 | |
| Frequency counter | Advantest TR5821AK | |
| Audio level meter | HP 3400A | |
| Low frequency oscillator | HP 8904 | |
| Color monitor | Sony BVM-D20F1U/DVM-D14H5U | |
| RF envelope tool (HJ-015) | J-6510-150-A | |
| Extension board (EX-410) | J-6420-260-A | |
| TP harness for adjustment (HJ-007) | J-6510-070-A | |
| Personal computer<br>• IBM PC/AT compatible or NEC PC-9800 series | | For details on settings, refer to “6-3. Selection of Terminal”. |
| RS-232C interface cable (For connecting PC)<br>• For IBM PC/AT compatible PC (9-pin) | | |
| RS-232C interface cable | J-6510-120-A | |
| Alignment tape | HR5-1A (8-960-076-01) | |
| Blank tape (*) | HDCAM cassette | |
| Cleaning cassette tape | BCT-HD12CL | |
| Adjustment driver | —— | Ceramic |
| Cassette tape with memory label (MLU-1B-100) | —— | |

(*) : Blank tape means a completely erased tape which can be recorded.

## 6-3. Selection of Terminal

When adjusting with the personal computer as the terminal, select the communication format as follows.

Baud rate : 9600 bps
Data : 8 bits
Parity : none
Stop : 1 bit
Flow control : none

## 6-4. Initial Settings of Switches

**Inside Panel**

VTR switch : STBY
GAIN switch : L (0 dB)
OUTPUT/DCC switch : CAM/OFF
WHITE BAL switch : PRST
AUDIO IN CH-1 switch : REAR
AUDIO IN CH-2 switch : REAR
AUDIO SELECT CH-1 switch : AUTO
AUDIO SELECT CH-2 switch : AUTO
F-RUN/SET/R-RUN switch : R-RUN
REAL TIME switch : OFF
DISPLAY switch : TC

**Rear Panel**

AUDIO IN CH-1 LINE/MIC/+48 V ON switch : LINE
AUDIO IN CH-2 LINE/MIC/+48 V ON switch : LINE

## 6-5. Servo System Adjustments

### 6-5-1. Capstan FG Adjustment

1. Connect CN1 of the SV-218 board and the personal computer using the RS-232C interface cable.
2. To enter to the TEST mode, turn ON the dip switch S1-1 of the HN-243 board.
3. Turn ON the power of the unit, and load an alignment tape (HR2-1A).
4. Execute the command “cap adj” for capstan adjustment from the personal computer.

```
SV218:>cap␣adj↵
```

5. The tape runs for more than ten seconds, and automatic adjustments will be carried out.
6. Data is displayed on the personal computer, indicating that automatic adjustments have completed.
7. Write the data in the NVRAM using the “nvram write” command.

```
SV218:>nvram␣write↵
```

8. Turn OFF the power of the unit, and remove the RS-232C interface cable from the SV-218 board.
9. To exit the TEST mode, set dip switch S1-1 of the HN-243 board to OFF.

## 6-5-2. DRUM PG Adjustments

Before performing this adjustment, perform the automatic adjustment first, and then check and fine adjust using manual adjustment.

### 1. Automatic Adjustment

1. Connect CN1 of the SV-218 board and the personal computer using the RS-232C interface cable.
2. To enter to the TEST mode, turn ON the dip switch S1-1 of the HN-243 board.
3. Turn TEST the all dip switches S1 and S2 of the UDR-36 board.
4. Turn ON the power of the unit, and load an alignment tape (HR2-1A).
5. Execute the command "drum adj" for drum adjustment from the personal computer.

```
SV218:>drum_adj ⏎
```

6. The tape runs for more than ten seconds, and automatic adjustments will be carried out.
7. Data is displayed on the personal computer, indicating that automatic adjustments have completed.
8. Write the data in the NVRAM using the "nvram write" command.

```
SV218:>nvram_write ⏎
```

9. Turn OFF the power of the unit, and remove the RS-232C interface cable from the SV-218 board.
10. To exit from the TEST mode, turn OFF the dip switch S1-1 of the HN-243 board.
11. Turn REC the all dip switches S1 and S2 of the UDR-36 board.

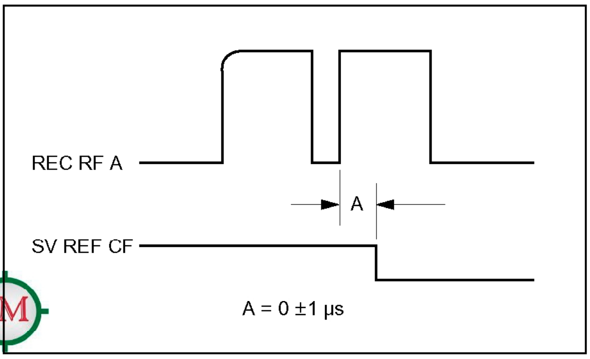
### 2. Manual Adjustment

1. Connect CN7 of the HN-243 board and the 8 pin connector of the TP harness.
2. Turn TEST all four of the dip switches S1 and S2 of the UDR-36 board.
3. Turn ON the switch S4 of the HN-243 board.
4. Turn ON the dip switch S1-1 of the HN-243 board, and turn OFF the dip switch S1-2.
5. Connect the oscilloscope to the 8 pin connector of the TP harness.
   Ch1 : REC RF A
   Ch2 (TRIG) : SV REF CF
6. Connect CN1 of the SV-218 board and the personal computer using the RS-232C interface cable.
7. Turn ON the power of the unit.
8. Load the alignment tape (HR2-1A) and play the signal from time 00:00:00 to time 00:15:00.
9. Execute the command "drum pg" from the personal computer.

```
SV218:>drum_pg ⏎
```

10. Adjust the value by the following key operations so that the marker part of RF wave and the standup part of REF wave meet the specification.

    i : +$0001 j : −$0001
    I : +$0010 J : −$0010
    u : +$0100 h : −$0100
    U : +$1000 H : −$1000



11. Once push [Enter] key, execute the command "nvram write".

```
SV218:>nvram_write ⏎
```

12. Push the EJECT button, take out the alignment tape and turn OFF the power of the unit.
13. Turn REC all four of the dip switches S1 and S2 of the UDR-36 board.
14. Turn OFF the switch S4 of the HN-243 board.
15. Turn OFF the dip switch S1-1 of the HN-243 board, and check to turn OFF the dip switch S1-2.

# 6-6. Audio System Adjustments

## 6-6-1. D/A Level Adjustment

Measuring instrument : Audio analyzer

---

### Preparations

#### Switch setting

- Switch in APR-55 board
  S103, S152 (INPUT LIMITER) : OFF
  S101 (CH1 FRONT MIC VR ON-OFF) : OFF
  S10, S402 (OUTPUT LIMITER) : OFF (Factory setting : ON)
  S400 (CUE ON-OFF) : OFF
- Inside panel
  AUDIO SELECT CH-1/CH-2 switch : MANUAL
  AUDIO IN CH-1/CH-2 switch : REAR

---

### Adjustment Procedures

1. Connect the AUDIO OUT Lch/rear panel to the audio analyzer (600 Ω reception).

2. Set AU REC 1 kHz in the VTR SET UP page of the MAINTENANCE menu to −20 dB, and set the TEST SG to ON by setting the OUTPUT/DCC switch on the inside panel to BARS.

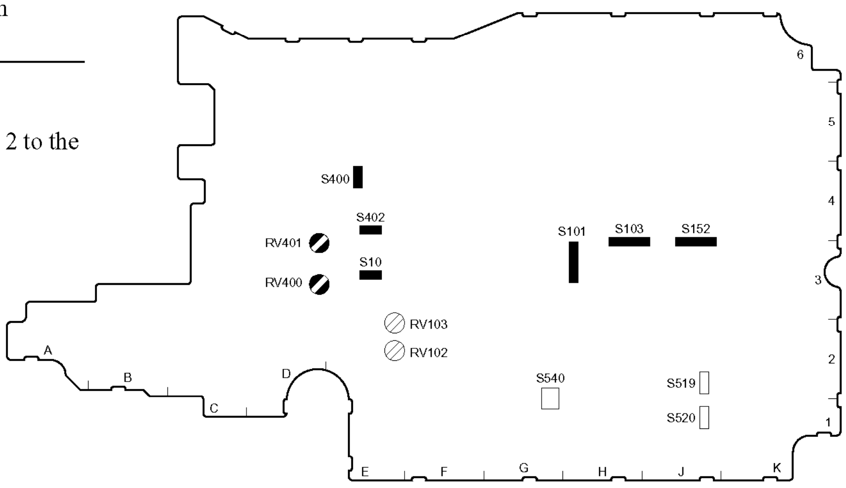
3. Adjust ⊘RV400 so that the level of the audio analyzer satisfies the specified value.
   Measuring point: AUDIO OUT Lch
   Adjusting point: ⊘RV400/APR-55 board
   Specification: 0 ±0.2 dBm

4. In the same way, connect the AUDIO OUT Rch/rear panel to the audio analyzer, and adjust ⊘RV401.
   Measuring point: AUDIO OUT Rch
   Adjusting point: ⊘RV401/APR-55 board
   Specification: 0 ±0.2 dBm

---

### Settings after adjustment

- Return the settings switched by step 2 to the former states.
- S10, S402 (OUTPUT LIMITER)/ APR-55 board : ON



APR-55 Board (B Side)

## 6-6-2. Output Limiter Adjustment

Measuring instrument : Audio analyzer

---

### Adjustment Procedures

1. Connect the AUDIO OUT Lch/rear panel to the audio analyzer (600 Ω reception).

2. Set AU REC 1 kHz in the VTR SET UP page of the MAINTENANCE menu to 0 dB, and set the TEST SG to ON by setting the OUTPUT/DCC switch on the inside panel to BARS.

3. Check that S10/APR-55 board (OUTPUT LIMITER) is ON.

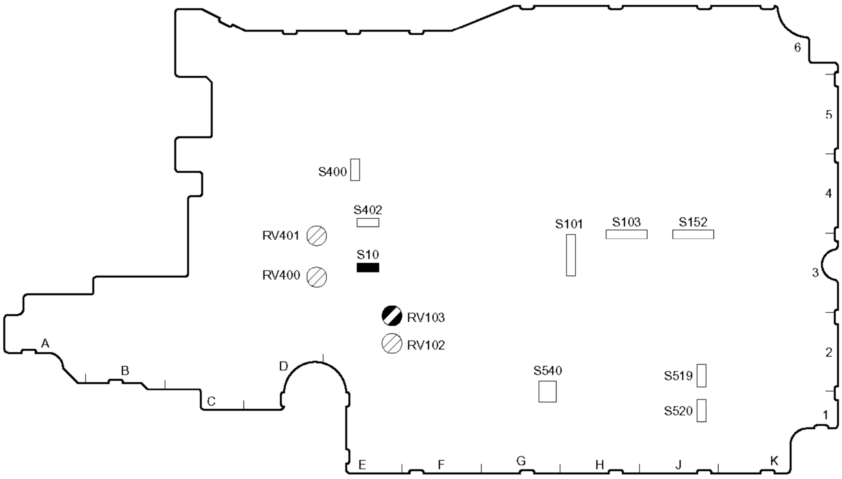
4. Adjust ⊘RV103 so that the level of the audio analyzer becomes 9 dBm.

| | |
|---|---|
| Measuring point: | AUDIO OUT Lch |
| Adjusting point: | ⊘RV103/APR-55 board |
| Specification: | +9.0 ±0.2 dBm |

---

### Setting after adjustment

Return the setting switched by step 2 to the former states.


S400
S402
RV401
S10
RV400
RV103
RV102
S101
S103
S152
S540
S519
S520
A
B
C
D
E
F
G
H
J
K
1
2
3
4
5
6

APR-55 Board (B Side)

## 6-6-3. AGC Level Adjustment

Measuring instrument : Audio analyzer

---

### Adjustment Procedures

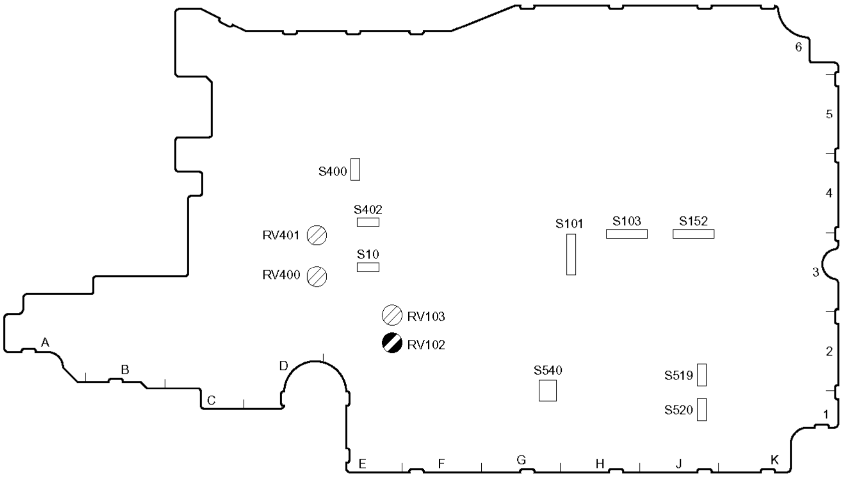
1. Connect the AUDIO OUT Lch/rear panel to the audio analyzer (600 Ω reception).

2. Input 1 kHz, +4 dBu to AUDIO IN CH 1.(*1)
   Set the AUDIO IN CH-1 LINE/MIC/+48 V ON switch on the rear panel to LINE.

3. Set the AUDIO SELECT CH-1 switch on the inside panel to AUTO.

4. Adjust ⊘RV102 so that the level of the audio analyzer becomes 0 dBm.
   Measuring point: AUDIO OUT Lch
   Adjusting point: ⊘RV102/APR-55 board
   Specification: 0 ±0.2 dBm

(*1) : As AUDIO IN is of high impedance, feed −1.7 dBm if the output impedance of the audio analyzer is 600 Ω.


6
5
4
3
2
1
S400
S402
RV401
S10
RV400
RV103
RV102
S101
S103
S152
S540
S519
S520
A
B
C
D
E
F
G
H
J
K

APR-55 Board (B Side)

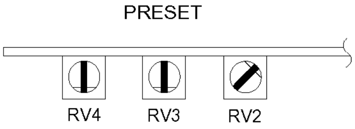
## 6-6-4. CUE Playback Level Adjustment

Measuring instrument : Audio analyzer

---

### Preparations

- Set the following switch.
  S400 (CUE ON-OFF)/APR-55 board : ON (Factory setting : OFF)
- Preset ⊘RV2, ⊘RV3 and ⊘RV4 on the CUE-2 board. (Refer to the figure.)



CUE-2 board

---

### Adjustment Procedures

1. Load an alignment tape (HR5-1A), and play the 1 kHz, 0 VU (TIME ; 00:00:00 to 01:24:29) signal.
   Measuring point : AUDIO OUT/rear panel
   Adjusting point : ⊘RV4/CUE-2 board
   Specification : 0 ±0.4 dBm

2. Press the STOP button.

3. Play the 1 kHz, −20 VU (TIME ; 01:30:00 to 02:24:29) signal.
   Measuring point : AUDIO OUT/rear panel
   Specification : −20.0 ±0.4 dBm
   Confirm the playback level meets the specification.

4. Press the STOP button.

5. Play the 10 kHz, −20 VU (TIME ; 03:00:00 to 03:55:29) signal.
   Measuring point : AUDIO OUT/rear panel
   Adjusting point : ⊘RV3/CUE-2 board
   Specification : ±1.5 dB against the 1 kHz playback level

6. Press the STOP button.

7. Perform step1 again, and confirm the specification is met.

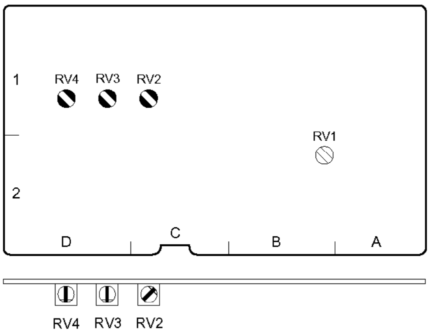
8. Press the STOP button.

9. Eject the alignment tape (IIR5-1A).

---

### Setting after Adjustment

S400 (CUE ON-OFF)/APR-55 board : OFF



CUE-2 Board (B Side)

## 6-6-5. CUE Recording Bias Adjustment

Measuring instrument : Audio analyzer
Oscilloscope

### Adjustment Procedures

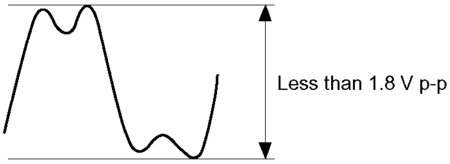
1. Connect the audio analyzer as follows.
   Measuring point : TP2/CUE-2 board
   GND : TP3/CUE-2 board

2. Connect the oscilloscope as follows.
   Measuring point : TP1/CUE-2 board
   GND : E1/CUE-2 board

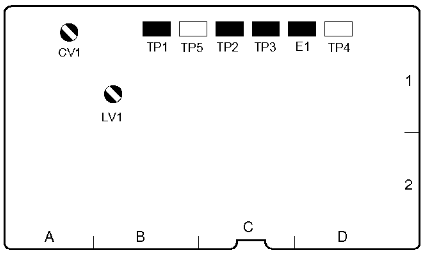
3. Remove the cable of the input signal (ANALYZER OUT).

4. Load the blank tape, and set the record mode.

5. Adjust ⊘CV1 and ⊘LV1 so that the value of the audio level meter (BIAS LEVEL) and waveform of the oscilloscope (BIAS leak) meet the following specifications.
   (Adjust the waveform-shape using ⊘LV1.)
   Adjustment points : ⊘CV1/CUE-2 board
   ⊘LV1/CUE-2 board
   Specifications : 18.5 ±1.0 mV rms (BIAS LEVEL)
   Less than 1.8 V p-p (BIAS leak)



6. Eject the blank tape.



CUE-2 Board (A Side)

## 6-6-6. CUE Recording Level Adjustment

Measuring instrument : Audio analyzer

---

### Adjustment Procedures

**Note**

Perform this adjustment under the state of Section 6-6-1 through Section 6-6-3 are correctly adjusted.

1. Input 1 kHz, +4 dBu to AUDIO IN CH1/rear panel. (*1)
   Set the LINE/MIC CH1/rear panel to LINE.

2. Connect the AUDIO OUT Lch/rear panel to the audio analyzer (600 Ω reception).

3. Set CUE IN switch/inside panel to CH1.

4. Set S400 (CUE ON-OFF) of the APR-55 board to ON. (Factory setting : OFF)

5. Load a blank tape and record for 10 seconds.

6. Play back the recorded part and check that it satisfies the following specification.
   Specification : 0 ±0.2 dBm
   If the level is out of specification, adjust ⊘RV1/CUE-2 board and repeat steps 5 and 6 until the specification is satisfied.

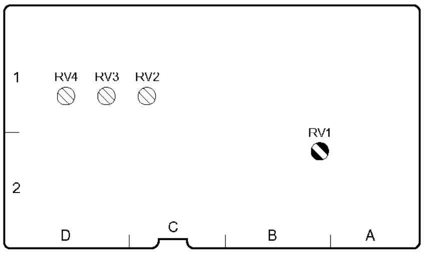
7. Eject the blank tape.

(∗1) : As AUDIO IN is of high impedance, feed −1.7 dBm if the output impedance of the audio analyzer is 600 Ω.

---

### Setting after Adjustment

S400 (CUE ON-OFF)/APR-55 board : OFF



CUE-2 Board (B Side)

# 6-7. RF System Adjustments

## 6-7-1. Precautions on RF System Adjustments

### Precautions on Operations

1. If the RF parameter of the NVRAM has been changed by the “rf adjust” menu, it will not be saved until “nvram write [Enter]” is executed.
   Therefore if the power is turned off without executing “nvram write”, all adjustment value will be erased, and the parameters will be set back to the values before the adjustments.

2. If servo lock is released or problems such as tape jamming occurs during RF adjustments, stop tape running immediately.
   In this case, turn off the power once without saving the adjustment results to set back the RF parameters to the values before the adjustments, resolve the cause of the problem, and adjust again.

3. Observe the error flags and envelope waveforms during adjustments so that tape damage and fixed errors can be discovered more easily.

### Precautions on Handling Tape

Handle the alignment tape, blank tape, and cleaning tape for RF adjustments, as follows.

1. For alignment tapes (HR5-1A), check the check box ( ☐ ) printed on the label every time after completing work of one unit. When all 50 check boxes have been checked, replace with a new tape.

2. Do not rewind the blank tape after completing work of one unit.
   After using 80 to 90% of the tape, rewind to the tape top, and check the check box ( ☐ ). Replace with a new tape when 10 check boxes have been checked.

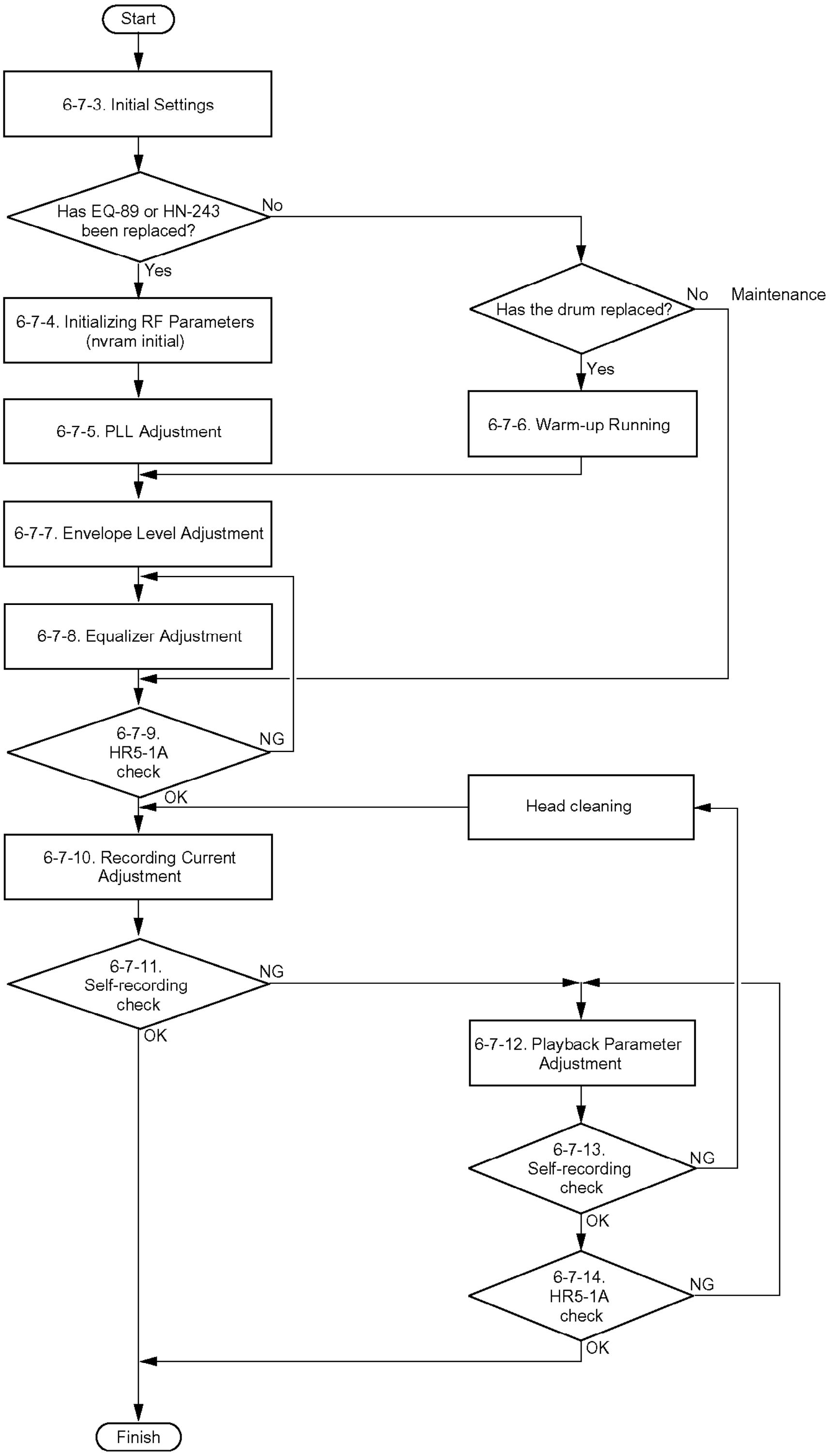
3. Do not use the one minute at the tape top and two minutes at the tape end of the blank tape.
   Do not use the area where the TAPE NEAR END alarm (TALLY) blinks.

4. For cleaning tape, do not rewind it after completing work of one unit.
   Replace with a new tape after using to the tape end.

5. Do not use the tapes (alignment tape and blank tape) which is used for another adjustments during the RF adjustments.

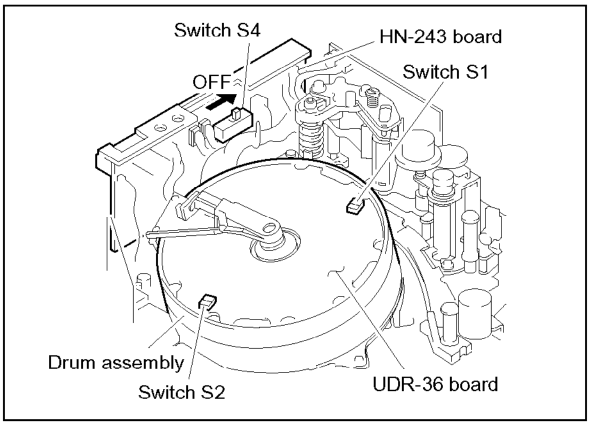
6. If the tape is damaged (jamming, scratches, etc.), replace with a new one immediately.
   Also check the tape path and servo system of the unit, and repair them if necessary.
   Failure RF can be found easily by observing the envelope waveform.

## 6-7-2. RF Adjustment Flow Chart


Start
6-7-3. Initial Settings
Has EQ-89 or HN-243 been replaced?
No
Yes
Has the drum replaced?
No
Maintenance
Yes
6-7-4. Initializing RF Parameters (nvram initial)
6-7-5. PLL Adjustment
6-7-6. Warm-up Running
6-7-7. Envelope Level Adjustment
6-7-8. Equalizer Adjustment
6-7-9. HR5-1A check
NG
OK
Head cleaning
6-7-10. Recording Current Adjustment
6-7-11. Self-recording check
NG
OK
6-7-12. Playback Parameter Adjustment
6-7-13. Self-recording check
NG
OK
6-7-14. HR5-1A check
NG
OK
Finish

### 6-7-3. Initial Settings

1. Check to see that S4 of the HN-243 board is OFF and all four bits of S1 and S2 of the UDR-36 board (upper drum) are REC.



2. Connect CN1 of SY-285 board and the personal computer using the RS-232C interface cable.

3. Extend the EQ-89 board with the extension board (EX-410/J-6420-260-A).

4. Connect the RF envelope tool to CN5 of EQ-89 board.

5. Start the RS-232C terminal software on the personal computer. (The terminal software must be installed.)

6. Turn ON the power of the unit.

7. Check that the signal processing boards (EN-143, ENC-59, DEC-95 ×2 pcs, VN-12) of the VTR are all normal at the BOARD STATUS page of the DIAGNOSIS menu.

## 6-7-4. Initializing RF Parameters

**Note**

Perform for the 59.94I, 50I, 23.98PsF format.

1. Set the RF parameter to the default value to initialize.

```
SY285>nvram␣initial ↵
```

2. Check the initialization of the RF parameters
   Check that the value of the RF adjustment menu is except 00.

   **Note**

   The initial value of the RF adjustment menu is different according to the format and ROM version of the SV-218 board.

   <Method>

```
SY285:>rf␣adjust ↵
RF ADJUST
       Ach  Bch  Cch  Dch  Ech  Fch  Gch  Hch
 ERR
 AMP   >60< 60   60   60   60   60   60   60
 PHS   40   40   40   40   40   40   40   40
 REC   36   36   36   36   36   36   36   36
 SPD   90   90   90   90
 NUL   90   90   90   90
 VTH   30   30   30   30
```

   +/– : [I] / [J]    To move the cursor : [ ← ][ ↑ ][ ↓ ][ → ]    To end : [Enter]

3. RF Menu Structure
   The RF menu is composed of the following three menus.

| | Frame (field) frequency |
|---|---|
| RF menu 1 | 60I, 59.94I, 30PsF, 29.97PsF |
| RF menu 2 | 50I, 25PsF |
| RF menu 3 | 24PsF, 23.98PsF |

The “rf adjust” command automatically calls the RF menu of the format currently selected.
The “nvram initial” command sets the default value for the RF menu of the format currently selected.

## 6-7-5. PLL Adjustment

Perform this adjustment when the EQ-89 or HN-243 board has been replaced.

**Note**

- Perform for the 59.94I, 50I, 23.98PsF format. Before performing the format change, be sure to save the adjustment data.
- Before performing this adjustment, be sure to initialize the RF parameters. (Refer to Section 6-7-4.)

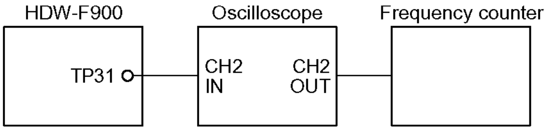
Measuring instruments : Oscilloscope
Frequency counter

### Preparations

- Disconnect the connectors (CN1, CN2, CN3, CN4) of the RF input harness of the EQ-89 board.
- Extend the EQ-89 board using the extension board (EX-410).

### Adjustment Procedures

1. Set the format to 59.94I.
2. Load a blank tape, and playback for about 5 minutes to warm-up running.
3. Connect a frequency counter to TP31 (A/Ech) of the extension board (EX-410).



4. Adjust the free-running frequency of the PLL by changing the Ach SPD.

Specifications : 47.0 ±0.2 MHz

<Method>

```
SY285:>rf_adjust ⏎
RF ADJUST
        Ach  Bch  Cch  Dch  Ech  Fch  Gch  Hch
 ERR
 AMP    60   60   60   60   60   60   60   60
 PHS    40   40   40   40   40   40   40   40
 REC    36   36   36   36   36   36   36   36
 SPD   >90<  90   90   90
 NUL    90   90   90   90
 VTH    30   30   30   30
```

+/− : [I] / [J]   To move the cursor : [ ← ][ ↑ ][ ↓ ][ → ]   To end : [Enter]

5. Adjust B/F, C/G, D/H ch in a similar manner by changing the SPD for corresponding channel.

| ch | EX-410 |
|---|---|
| A/E | :TP31 |
| B/F | :TP27 |
| C/G | :TP23 |
| D/H | :TP19 |

6. Save the adjustment results.

```
SY285:>nvram␣write⏎
WRITING...DONE
```

7. Switch the format to 50I and adjust according to steps 3, 4 and 5.
   Specification : 39.2 ±0.2 MHz

8. Save the adjustment results.

```
SY285:>nvram␣write⏎
WRITING...DONE
```

9. Switch the format to 23.98PsF and adjust according to steps 3, 4 and 5.
   Specification : 37.6 ±0.2 MHz

10. Save the adjustment results.

```
SY285:>nvram␣write⏎
WRITING...DONE
```

11. Eject the blank tape.

12. Connect the connectors (CN1, 2, 3, 4) of the RF input harness of the EQ-89 board.
    <Note on Connection> (From top) CN1 : Red (A/E ch)
    CH2 : Orange (B/F ch)
    CN3 : Yellow (C/G ch)
    CN4 : Blue (D/H ch)

## 6-7-6. Warm-up Running

1. Clean the head using the cleaning tape (BCT-HD12CL). (Run for 5 seconds.)

2. Load a blank tape, and perform warm-up running in the playback mode for 40 minutes. (Together with preheat)

3. Clean the head with alcohol. (Refer to Section 6 of the maintenance manual part 1.)

## 6-7-7. Envelope Level Adjustment

**Note**

Perform for the 59.94I system only.

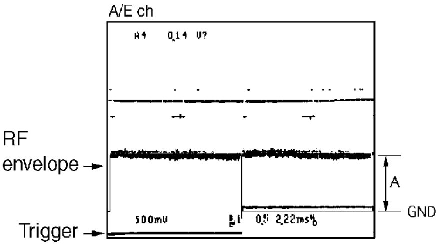
Measuring instrument : Oscilloscope
Tools : RF envelope tool (HJ-015 ; J-6510-150-A)
Alignment tape HR5-1A

### Preparations

Connect the RF envelope tool.

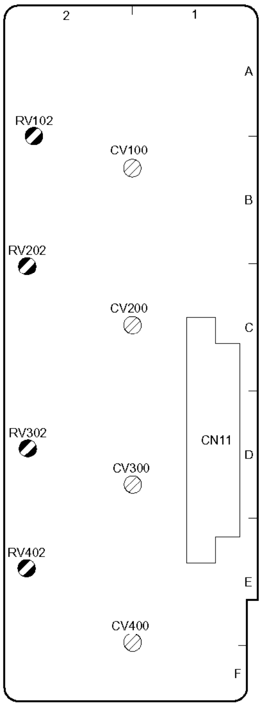
### Adjustment Procedures

1. Set the format to 59.94I.
2. Load the alignment tape (HR5-1A) and set the PB mode.
3. Connect the oscilloscope to the TP of the RF envelope tool.
   Adjust the envelope level of the A/E, B/F, C/G, and D/H channels.
   (Adjust the RV corresponding to the channel.)



Perform the adjustment with the greater envelope level.

| ch | RV |
|---|---|
| A/E | ⊘ RV102 |
| B/F | ⊘ RV202 |
| C/G | ⊘ RV302 |
| D/H | ⊘ RV402 |

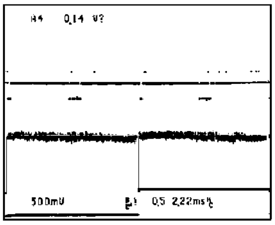


EQ-89 Board (A Side)

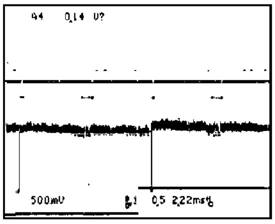
Specification : A = 3.0 ±0.2 V

Trigger : Refer to the following photos for how to differentiate the channels of the PB A/E SEL of RF envelope tool.

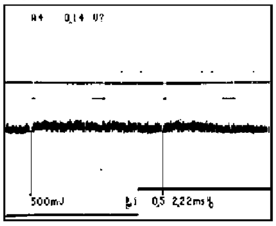
A/E ch Photo-1



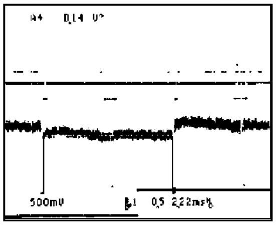
B/F ch Photo-2



C/G ch Photo-3



D/H ch Photo-4



4. Also check if the envelope waveform is flat or not.
   If the waveform of the entrance/exit has sunk, etc., re-adjust the tape path.

   Specification : Envelope waveform (from entrance to exit) is flat.

5. Eject the Alignment tape (HR5-1A).

## 6-7-8. Equalizer Adjustment

**Note**

Perform for the 59.94I, 50I, 23.98PsF format.

Measuring instrument : Oscilloscope
Tools : RF envelope tool (HJ-015 ; J-6510-150-A)
Alignment tape HR5-1A
Extension board EX-410

---

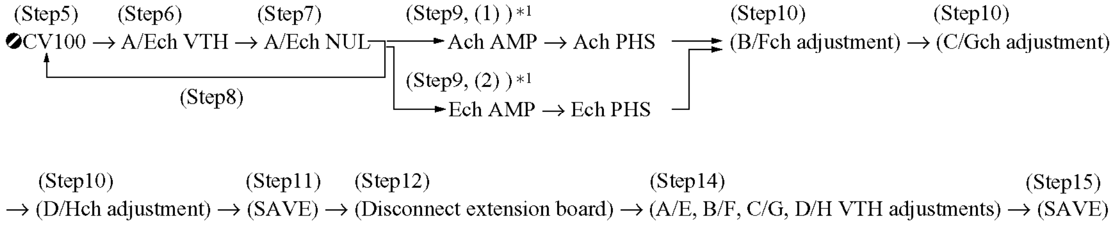
### Preparations

Extend the EQ-89 board using the extension board (EX-410).

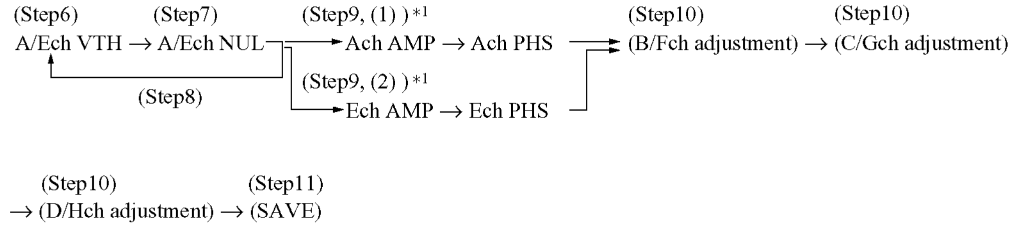
---

### Overviews

- Adjusting procedure of 59.94I


(Step5)
⊘CV100
(Step6)
A/Ech VTH
(Step7)
A/Ech NUL
(Step8)
(Step9, (1) ) *1
Ach AMP → Ach PHS
(Step9, (2) ) *1
Ech AMP → Ech PHS
(Step10)
(B/Fch adjustment)
(Step10)
(C/Gch adjustment)
(Step10)
(D/Hch adjustment)
(Step11)
(SAVE)
(Step12)
(Disconnect extension board)
(Step14)
(A/E, B/F, C/G, D/H VTH adjustments)
(Step15)
(SAVE)

- Adjusting procedure of 50I and 23.98PsF


(Step6)
A/Ech VTH
(Step7)
A/Ech NUL
(Step8)
(Step9, (1) ) *1
Ach AMP → Ach PHS
(Step9, (2) ) *1
Ech AMP → Ech PHS
(Step10)
(B/Fch adjustment)
(Step10)
(C/Gch adjustment)
(Step10)
(D/Hch adjustment)
(Step11)
(SAVE)

*1 : In case of the Section 6-7-9 is out of spec.

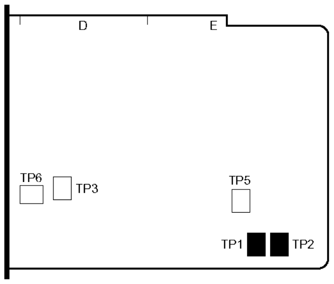
---

### Adjustment Procedures

1. Set the format to 59.94I.

2. Load an alignment tape (HR5-1A) and set the playback mode.

3. Measuring point : TP1/DEC-95A board (SLOT14)
   TRIG : PB A/E SEL/RF envelope tool


D
E
TP6
TP3
TP5
TP1
TP2

DEC-95 Board (A Side)

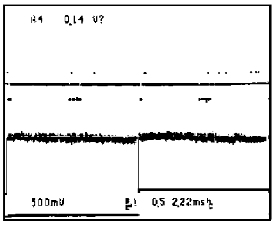
4. Open the RF menu.
   <Method>

```
SY285:>rf_adjust⏎
RF ADJUST
        Ach  Bch  Cch  Dch  Ech  Fch  Gch  Hch
 ERR
 AMP   >60<  60   60   60   60   60   60   60
 PHS    40   40   40   40   40   40   40   40
 REC    36   36   36   36   36   36   36   36
 SPD    90   90   90   90
 NUL    90   90   90   90
 VTH    2A   2A   2A   2A
```

+/− : [I] / [J]    To move the cursor : [ ← ][ ↑ ][ ↓ ][ → ]    To end : [Enter]

5. Minimize the error flag with ⊘CV100 (sampling phase).

A/E ch    Photo-1



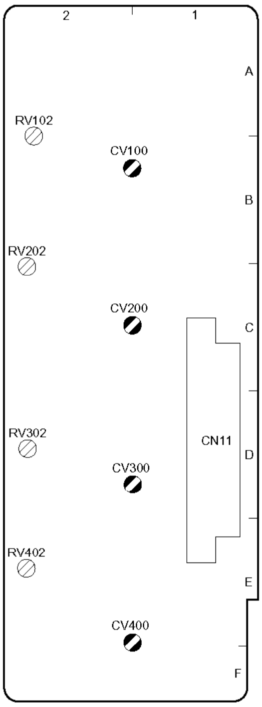
6. Change the A/Ech VTH, and minimize the A/Ech error flag.

7. Change the A/Ech NUL, and minimize the A/Ech error flag.

8. Repeat steps 5 to 7.

9. In case of this adjustment is performed again that the check in Section 6-7-9 is out of the specification, perform the following two adjustments.
   (1) Adjust to minimize the Ach error flag by changing Ach, AMP, PHS.
   (2) Adjust to minimize the Ech error flag by changing Ech, AMP, PHS.

10. Adjust in a similar manner as steps 2 through 9 for B/F, C/G, and D/Hch.

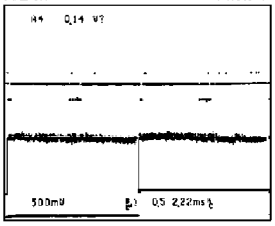


EQ-89 Board (A Side)

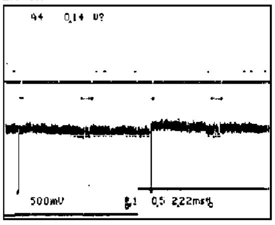
| ch | DEC-95 | TP | CV | Photo |
|---|---|---|---|---|
| A/E | DEC A SLOT14 | TP1 | ⊘CV100 | 1 |
| B/F | DEC B SLOT15 | TP1 | ⊘CV200 | 2 |
| C/G | DEC A SLOT14 | TP2 | ⊘CV300 | 3 |
| D/H | DEC B SLOT15 | TP2 | ⊘CV400 | 4 |

Refer to the following photos for how to differentiate the channels.

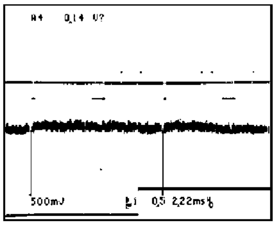
A/E ch Photo-1



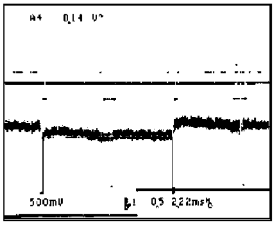
B/F ch Photo-2



C/G ch Photo-3



D/H ch Photo-4



11. Save the adjustment results.

```
SY285:>nvram_write↵
WRITING...DONE
```

12. Turn the power off, and disconnect the extension board (EX-410). And then connect the EQ-89 board.

13. Turn the power on again, and open the RF menu.

14. Load the alignment tape (HR5-1A) and set the playback mode. Re-adjust the A/Ech, B/Fch, C/Gch and D/Hch VTHs respectively.

15. Save the re-adjustment results.

```
SY285:>nvram_write↵
WRITING...DONE
```

16. Set the format to 50I, and perform steps 6 to 11 in the same way (step 5 is not necessary).

17. Set the format to 23.98PsF, and perform steps 6 to 11 in the same way (step 5 is not necessary).

18. Eject the alignment tape (HR5-1A).

## 6-7-9. Alignment Tape Channel Condition Check (Step 1)

**Note**

Check the 59.94I, 50I, 23.98PsF format.

1. Set the format to 59.94I.

2. Load an alignment tape (HR5-1A) and set the playback mode.

3. Measure the channel conditions.

```
SY285:>err␣rate ↵
<<ERROR RATE COUNT:8frame>>
         Ach  Bch  Cch  Dch  Ech  Fch  Gch  Hch
COUNT: xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
SY285:>
```

   **Note**

   To eliminate the measurement errors by drop out, repeat the measurement several times (up to 5 times) and use the smallest number.

4. Venify that the value of each channel (xxxx) is within the specification.

   Specification : Below 0094h

5. If any channel is out of the specification, return to “6-7-8. Equalizer Adjustment” and perform adjustments again.

6. Set the format to 50I, and repeat steps 2 to 5.

7. Set the format to 23.98PsF and repeat steps 2 to 5.

8. Eject the alignment tape.

## 6-7-10. Recording Current Adjustment

**Note**

Check the 59.94I, 50I, 23.98PsF format.

| | |
|---|---|
| Measuring instrument : | Oscilloscope |
| Tools : | RF envelope tool (HJ-015 ; J-6510-150-A)<br>Blank tape (HDCAM cassette) |

---

### Adjustment Procedures

1. Set the format to 59.94I.

2. Load a blank tape and set the REC mode.

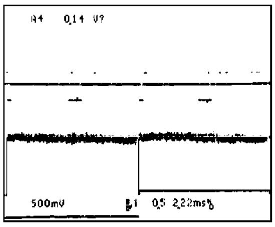
3. Set the REC Confi mode.

```
SY285:>vtr␣confi ⏎
CONFI MODE
SY285:>
```

4. Measuring point : TP1/DEC-95A board (SLOT14)
   TRIG : PB A/E SEL/RF envelope tool

5. Change the number (Ach recording current), and adjust so that the Ach error flag becomes minimum.

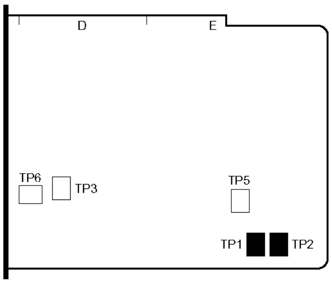
A/E ch



<Method>

```
SY285:>rf␣adjust ⏎
RF ADJUST
        Ach   Bch  Cch  Dch  Ech  Fch  Gch  Hch
 ERR
 AMP    >60<  60   60   60   60   60   60   60
 PHS    40    40   40   40   40   40   40   40
 REC    >36<  36   36   36   36   36   36   36
 SPD    90    90   90   90
 NUL    90    90   90   90
 VTH    30    30   30   30
```

+/− : [I] / [J]     To move the cursor : [ ← ][ ↑ ][ ↓ ][ → ]  To end : [Enter]



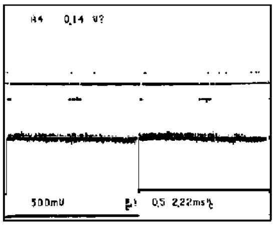
DEC-95 Board (A Side)

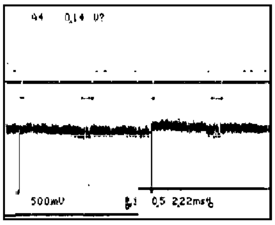
6. Like step 5, change the Ech recording current, and adjust to minimize the Ech error flag.

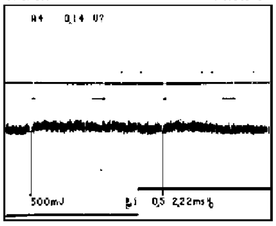
7. Repeat steps 4 through 6 for the B, C, D, E, F, G and H channels.

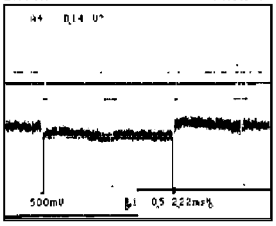
| ch | DEC-95 board | TP (DEC-95 board) | Photo |
|---|---|---|---|
| A | DEC A SLOT14 | TP1 | 1 |
| E | DEC A SLOT14 | TP1 | 1 |
| B | DEC B SLOT15 | TP1 | 2 |
| F | DEC B SLOT15 | TP1 | 2 |
| C | DEC A SLOT14 | TP2 | 3 |
| G | DEC A SLOT14 | TP2 | 3 |
| D | DEC B SLOT15 | TP2 | 4 |
| H | DEC B SLOT15 | TP2 | 4 |

Refer to the following photos for how to differentiate the channels.


A/E ch Photo-1


B/F ch Photo-2


C/G ch Photo-3


D/H ch Photo-4

8. Save the adjustment results.

```
SY285:>nvram␣write⏎
WRITING...DONE
```

9. Set the format to 50I, and repeat steps 2 to 8.

10. Set the format to 23.98PsF, and repeat steps 2 to 8.

11. Eject the blank tape.

## 6-7-11. Self-Recording/Playback Channel Condition Check (Step 1)

**Note**

Check the 59.94I, 50I, 23.98PsF format.

1. Set the format to 59.94I.

2. Load a blank tape and prepare a self-recording tape. (Record around one minute.)

3. Rewind and play the recorded portion.

4. Measure the channel conditions.

```
SY285:>err␣rate ↵
<<ERROR RATE COUNT:8frame>>
         Ach  Bch  Cch  Dch  Ech  Fch  Gch  Hch
COUNT:  xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
SY285:>
```

   **Note**

   To eliminate the measurement errors by drop out, repeat the measurement several times (up to 5 times) and use the smallest number.

5. Verify that the value of each channel (xxxx) is within the specification.

   Specification : Below 0094h

6. Set the format to 50I, and repeat steps 2 to 5.

7. Set the format to 23.98PsF and repeat steps 2 to 5.

8. Eject the blank tape.

9. If any channel is out of the specifications, proceed to “6-7-12. Playback Parameter Adjustment”. End the RF adjustments if all channels are satisfied.

## 6-7-12. Playback Parameter Adjustment

**Note**

In the case of the “6-7-11 Self-Recording/Playback Channel Condition Check” or “6-7-14 Alignment Tape Channel Condition Check” is out of the specification, perform this adjustment.

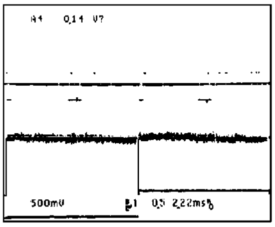
1. When the “6-7-11 Self-Recording/Playback Channel Condition Check” is out of the specification.
   (1) Load a blank tape, and prepare a self-recording tape. (Record around one minute.)
   (2) Rewind and play back the recorded portion.

2. When the “6-7-14 Alignment Tape Channel Condition Check” is out of the specification, playback the alignment tape (HR5-1A).

3. When the A/Ech is out of the specification.
   Connect an oscilloscope to TP1 (A/Ech error flag) of the DEC-95A board (SLOT 14).
   (Trigger : PB A/E SEL of the RF envelope tool)

4. Re-adjust the A/Ech, NUL, VTH, AMP, and PHS value (xx:hex), and adjust to minimize the A/Ech error flag.

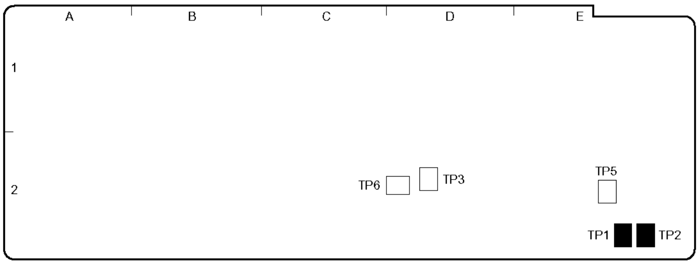
A/E ch



<Method>

```
SY285:>rf_adjust ⏎
RF ADJUST
        Ach  Bch  Cch  Dch  Ech  Fch  Gch  Hch
 ERR
 AMP    60   60   60   60   60   60   60   60
 PHS    40   40   40   40   40   40   40   40
 REC    36   36   36   36   36   36   36   36
 SPD    90   90   90   90
 NUL   >90<  90   90   90
 VTH    30   30   30   30
```

+/− : [I] / [J]   To move the cursor : [ ← ][ ↑ ][ ↓ ][ → ]   To end : [Enter]



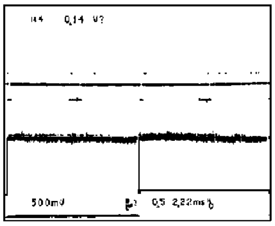
DEC-95 Board (A Side)

5. When the B, C, D, F, G and H channels are out of the specifications, perform adjustments as the same procedures of steps 3 and 4.

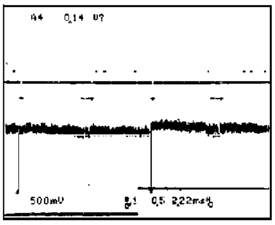
| ch | DEC-95 board | TP (DEC-95 board) | Photo |
|---|---|---|---|
| A | DEC A SLOT14 | TP1 | 1 |
| E | DEC A SLOT14 | TP1 | 1 |
| B | DEC B SLOT15 | TP1 | 2 |
| F | DEC B SLOT15 | TP1 | 2 |
| C | DEC A SLOT14 | TP2 | 3 |
| G | DEC A SLOT14 | TP2 | 3 |
| D | DEC B SLOT15 | TP2 | 4 |
| H | DEC B SLOT15 | TP2 | 4 |

Refer to the following photos for how to differentiate the channels.

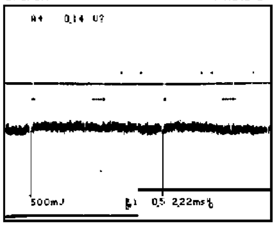
A/E ch Photo-1



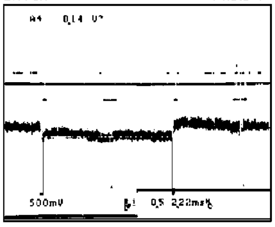
B/F ch Photo-2



C/G ch Photo-3



D/H ch Photo-4



6. Save the adjustment results.

```
SY285:>nvram␣write↵
WRITING...DONE
```

7. Eject the blank tape or alignment tape (HR5-1A).

8. After adjustment, proceed onto “6-7-13. Self Recording/Playback Channel Condition Check”.

## 6-7-13. Self Recording/Playback Channel Condition Check (Step 2)

1. Load a blank tape and prepare a self-recording tape.

2. Rewind and play the recorded portion. (Record around one minute.)

3. Measure the channel conditions.

```
SY285:>err␣rate ⏎
<<ERROR RATE COUNT:8frame>>
         Ach  Bch  Cch  Dch  Ech  Fch  Gch  Hch
COUNT: xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
SY285:>
```

**Note**

To eliminate the measurement errors by drop out, repeat the measurement several times (up to 5 times) and use the smallest number.

4. Verify that the value of each channel (xxxx) is within the specification.

   Specification : Below 0094h

5. Eject the blank tape.

6. If any channel is out of the specification, clean the head using a cleaning tape (run 5 seconds), then run 10 minutes with blank tape, and perform the re-adjustments of “6-7-10 Recording Current Adjustment” and later.
   If all channels are satisfactory, proceed onto “6-7-14. Alignment Tape Channel Condition Check (Step 2)”.

## 6-7-14. Alignment Tape Channel Condition Check (Step 2)

1. Load an alignment tape (HR5-1A) and play the tape.

2. Measure the channel conditions.

```
SY285:>err␣rate ⏎
<<ERROR RATE COUNT:8frame>>
        Ach  Bch  Cch  Dch  Ech  Fch  Gch  Hch
COUNT: xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
SY285:>
```

**Note**

To eliminate the measurement errors by drop out, repeat the measurement several times (up to 5 times) and use the smallest number.

3. Verify that the value of each channel (xxxx) is within the specification.

   Specification : Below 00FFh

4. Eject the alignment tape.

5. If any channel is out of the specification, return to "6-7-12. Playback Parameter Adjustment" and adjust the parameter again until the specification is satisfied.
   End the RF adjustment if all channels are satisfactory.

## 6-7-15. List of RF Adjustment Related Commands

| Commands | Contents |
|---|---|
| nvram write | write data to NVRAM |
| vtr confi | confi mode ON |
| rf adjust | open RF Adjust Menu |
| err rate | dump RF Error count |
| status | VTR status |
| nvram initial | NVRAM Data Initialize |

## 6-8. CCM-33B Board Adjustment

| | |
|---|---|
| Measuring instrument : | Oscilloscope |
| Tools : | Personal computer<br>RS-232C interface cable<br>Cassette tape with memory label (MLU-1B-100) |

---

### Preparations

**Note**

Handle the flexible card wires carefully as they break easily.

1. Insert the cassette tape with memory label (MLU-1B-100).

2. Turn the power off.

3. Remove the outside panel. (Refer to Section 2-4 of the maintenance manual part 1.)

4. Remove the DC-DC converter, and remove the CCM-33B board. (Refer to Section 3-1-3.)

5. Install the DC-DC converter. (Refer to Section 3-1-3.)

   **Notes**

   - When installing the DC-DC converter, take care about the direction, and insert the RE-140 board along the groove of the chassis. (Refer to Section 3-1-3.)
   - Confirm the DC-DC converter is surely installed in the unit.

6. Connect the antenna flexible board and harness to CN1 and CN2 on the CCM-33B board.

## Adjustment Procedures

**Notes**

Pay careful attention to the following points to perform the correct adjustment.

- During adjustment, be sure not to use the antenna flexible board and cassette compartment assembly of other HDW-F900.
- Be sure to install the antenna flexible board and cassette compartment assembly to the unit before adjustment.
- Keep the antenna flexible board away from the piece of metal such as chassis and so no.
- Never contact the piece of metal with the CCM-33B board.

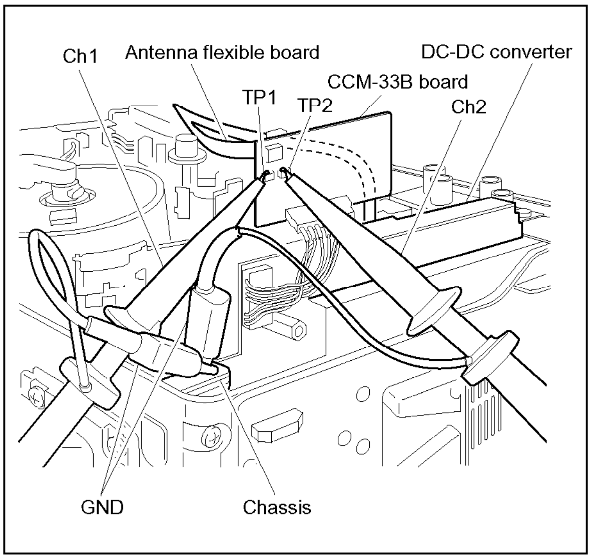
1. Set the oscilloscope as follows.
   VERTICAL
   Ch1: 5 V/DIV, DC
   Ch2: 5 V/DIV, DC
   MODE: Ch2 INVERT, ADD, 20 MHz BW LIMIT = OFF
   HORIZONTAL
   20 ns/DIV
   TRIGGER
   Ch1, DC
   LEVEL: 5 V

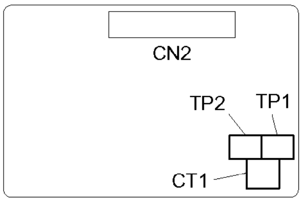
2. Connect the ground terminals of Ch1 and Ch2 to the chassis that the outside panel is installed as shown in the figure.

   **Note**

   Never contact the ground probes with CCM-33B board. This may cause damage to the CCM-33B board.

3. Connect Ch1 to TP1, and Ch2 to TP2.





CCM-33B Board (A Side)

4. Connect CN1 on the SY-285 board and personal computer using RS-232C interface cable.

5. Turn the power on.

6. Input the memory label reader/writer adjustment command from the computer.

```
SY285:>tl␣check⏎
```

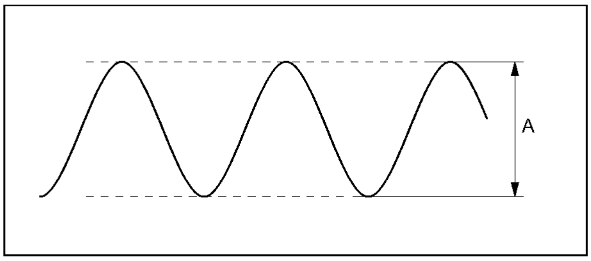
7. Adjust ⊘CT1 using adjustment driver to meet the specification.

   **Note**

   Confirm the "OK" is displayed on the personal computer.

Adjustment point: ⊘CT1/CCM-33B board

Specification: A = maximum value (more than 10 V p-p of sine waveform)



8. Turn the power off, and disconnect the RS-232C interface cable from the SY-285 board.

9. Install the CCM-33B board. (Refer to Section 3-1-3.)

   **Note**

   Be careful attention to arrange the antenna flexible board. (Refer to Section 3-1-3.)

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